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Checklist of Canadian Freshwater Fishes with Keys for Identification

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CHECKLIST OF CANADIAN FRESHWATER FISHES
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W.B. SCOTT

and

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INTRODUCTION

This annotated checklist is an outgrowth of earlier lists released in 1958 and 1967. The keys are either newly prepared, adapting certain features of previously published keys, or are adapted from keys in other of the authors' publications (Scott and Crossman 1964; Leim and Scott 1966; Scott 1967). It is hoped that the present list and keys will serve as a useful aid to all those interested in the Canadian freshwater fish fauna. They also constitute a step in the preparation of a comprehensive text on the freshwater fishes of Canada, being sponsored by the Fisheries Research Board of Canada. The authors earnestly solicit constructive comments on the contents of this publication, so that the text mentioned may be as accurate as possible.

The checklist includes 183 species in 24 families. Changes in nomenclature have occurred for many species since publication of previous lists. Such changes are designated in the present list by an annotation beginning with the word "Formerly ...". This list is in general accord, both in scientific and in common names, with Special Publication No. 2 (1960) of the American Fisheries Society entitled, "A list of common and scientific names of fishes from the United States and Canada", which is currently being revised.

For simplicity, we have avoided subspecies designations as separate entities, even when the two forms are known by distinct names. Annotated references are usually made to both forms when pertinent. For convenience,species are listed in alphabetical order within genera, subfamilies or families.

Below each species in the main body of the checklist is a series of annotations which designate the various political areas in which that species occurs. The meanings of the abbreviations are as follows:

Nfld. - Insular Newfoundland
Lab. - Labrador (Newfoundland)
N.S. - Nova Scotia
P.E.I. - Prince Edward Island
N.B. - New Brunswick
Que. - Quebec
Ont. - Ontario
Man. - Manitoba
Sask. - Saskatchewan
Alta. - Alberta
B.C. - British Columbia
NWT. - Northwest Territories
Y.T. - Yukon Territory

When species have been introduced, the province or territory is marked with an asterisk. If a question mark follows the asterisk, it indicates that the success of the introduction is in doubt. For such species as the brown trout which are introduced throughout their Canadian range, the areas of occurrence are placed in parentheses and the asterisk appears only after the last parenthesis. For some native species such as the rainbow trout which are widely introduced outside their native range elsewhere in Canada, the areas of introduction are placed in parentheses and marked with an asterisk after the last parenthesis.

A section entitled, "Species of Doubtful Occurrence" has been included which lists fishes that have been recorded from fresh water, but whose occurrence is so rare or tenuous as to make their inclusion in the freshwater fauna questionable.

Also included are summaries of the number of species known to occur in the various provinces, territories, and major watersheds.

Our knowledge of Alberta fishes has been increased greatly, largely from a recent series of publications by Henderson and Peters (1969), Paetz (1967), Paetz and Nelson (1968), Willock (1968), and Willock (in press).

The artificial keys to the identity of the fishes consist of a key to the families and of keys to the species of each family represented by more than one species.

The keys are of the usual variety, consisting of couplets, each half of which leads to another couplet or to the name of a single species. We have attempted to avoid, wherever possible, the necessity of making a decision based on a single characteristic, or on only internal anatomical features. The keys are prepared for use in identifying both preserved and living fishes. Wherever prominent features of the living fish differ from those of the preserved specimen, or where features of living fish would assist in identification, they have been included.

The lamprey key is limited to adults, since the accurate identification of larval lampreys or ammocetes is unusually difficult and requires considerable care and experience.

In the family key, families represented by a single species in Canada do not have a page number leading to a key to the species. See the checklist entry for the family.

ACKNOWLEDGEMENTS

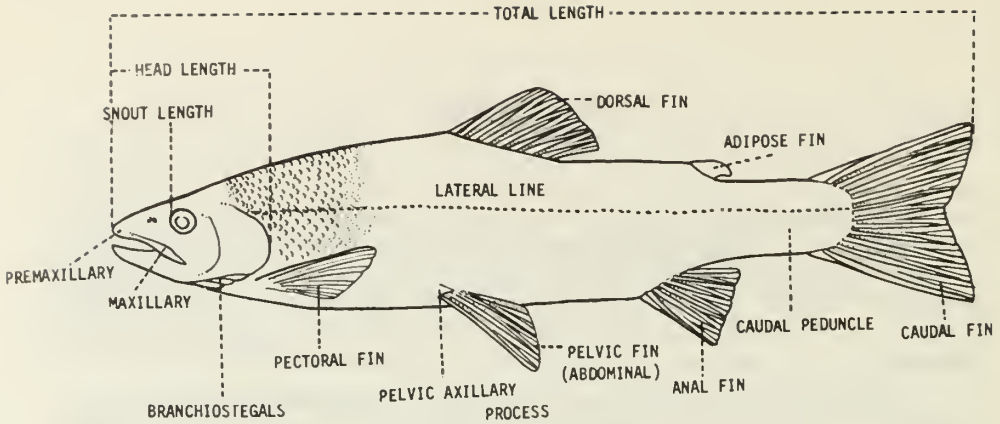
The following people, who so kindly replied to our request for comments and suggestions contained in the 1967 list, have helped to make this list more accurate: Drs. K.R. Allen, R.M. Bailey, C.F. Cole, B.B. Collette, C.C. Lindsey, D.E. McAllister, J.S. Nelson, J.R. Nursall, and Messrs. R.E. Jenkins, J.J. Keleher, V. Legendre, C. Paterson, R.J. Paterson, T.A. Willock, D.E. Woronecki.

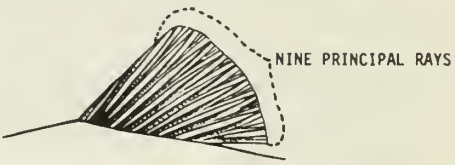
The drawings were prepared by Mr. P. Buerschaper except the schematic drawing of the lamprey mouth which was made by Mr. A. Odum. The map was prepared by Miss Barbara Atkinson.

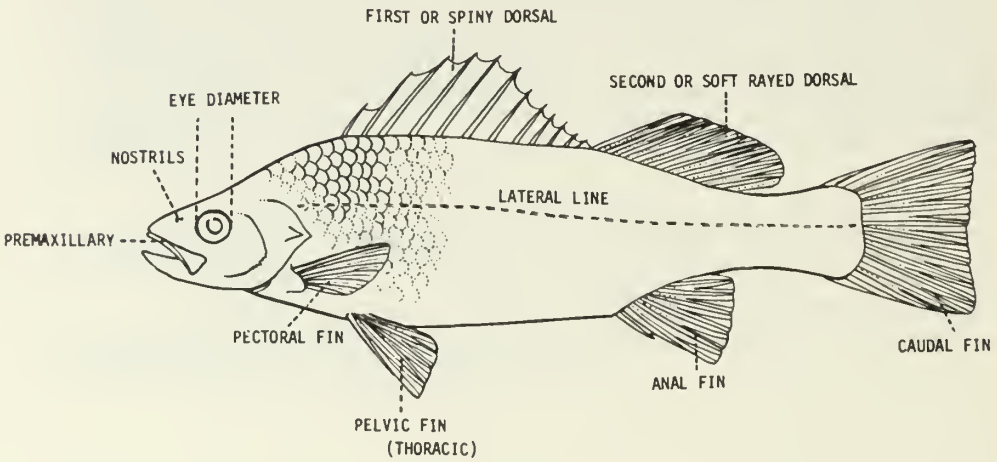
Misses Barbara Atkinson, Margaret Emery, Rebecca Rowlandson, Mrs. Milly Scott, Messrs. P. Buerschaper, S. Campbell and S. Taylor tested the various keys and assisted in the editing.

The demanding task of final editing and typing was cheerfully carried out by Monica Hunter.

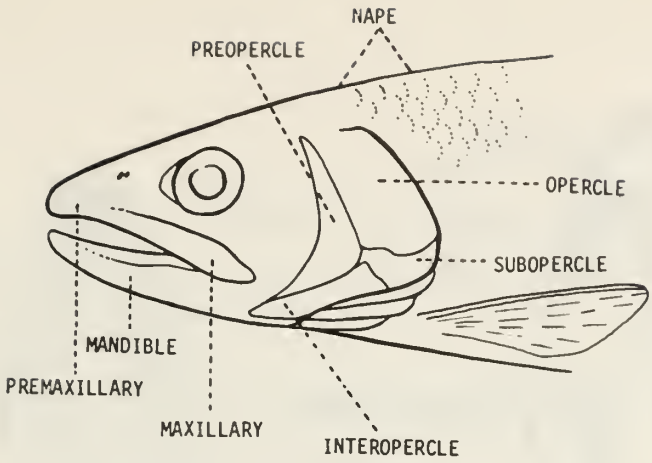
We are grateful for the editorial advice and assistance given by Olive Koyama.

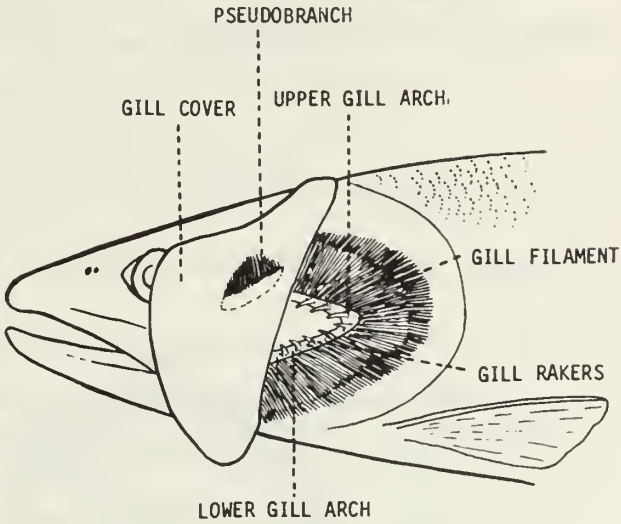


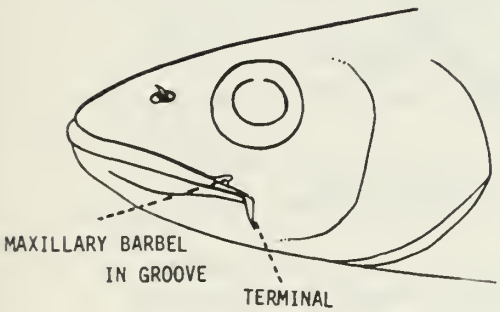




SKETCHES OF HYPOTHETICAL FISHES SHOWING FEATURES NOTED IN TEXT







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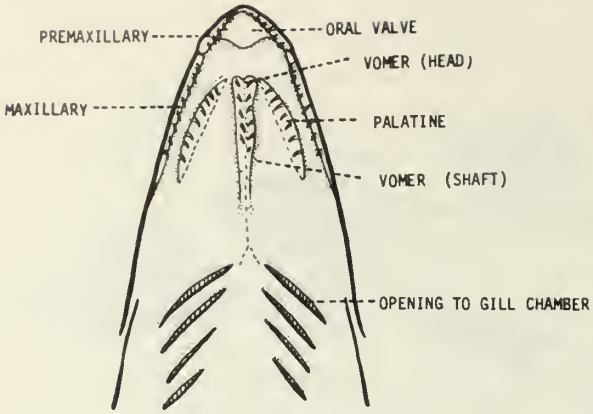
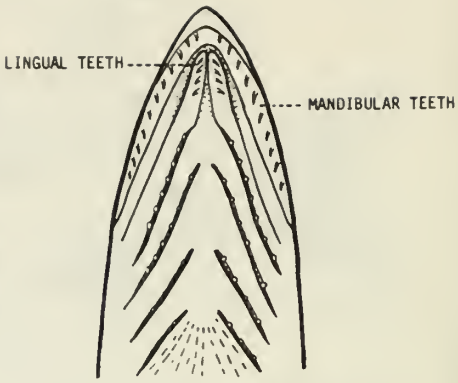
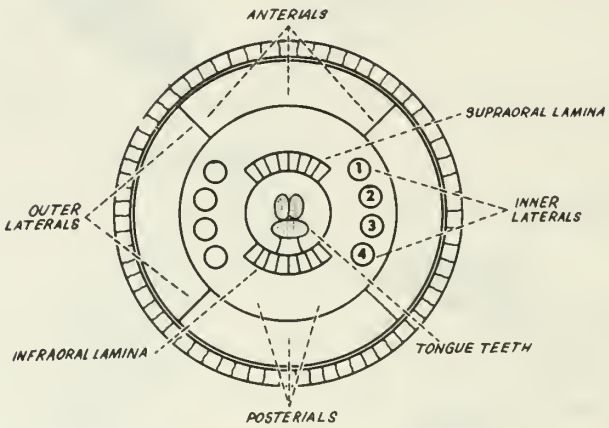
SKETCHES OF HYPOTHETICAL FISHES SHOWING FEATURES NOTED IN TEXT



VENTRAL VIEW OF UPPER JAW, MOUTH AND PHARYNX



DORSAL VIEW OF LOWER JAW, MOUTH AND PHARYNX



SCHEMATIC REPRESENTATION OF THE BUCCAL FUNNEL OF A LAMPREY

SKETCHES OF HYPOTHETICAL FISHES SHOWING FEATURES NOTED IN TEXT

CHECKLIST

Class AGNATHA (Marsipobranchii)

Order PETROMYZONTIFORMES (Hyperoartia)

f. Petromyzontidae - lampreys

Entosphenus tridentatus (Gairdner) 1836 - Pacific lamprey
B.C., Alaska
Formerly *Lampetra tridentata* (Gairdner).

Ichthyomyzon castaneus Girard 1858 - chestnut lamprey
Man.

Ichthyomyzon fossor Reighard and Cummins 1916 - northern brook lamprey
Que., Ont.

Ichthyomyzon unicuspis Hubbs and Trautman 1937 - silver lamprey
Que., Ont., Man.

Lampetra ayresi (Günther) 1870 - river lamprey
B.C.
Formerly *L. fluviatilis* (Linnaeus). *L. ayresi* previously relegated to synonymy of the European form *L. fluviatilis*. West Coast river lamprey shown by Vladykov and Follett, 1958, to be distinct.

Some species previously listed in the genus *Entosphenus* are now listed in the genus *Lampetra*.

Lampetra japonica (Martens) 1868 - Arctic lamprey
NWT., Y.T., Alaska
Formerly *Entosphenus japonicus* (Martens).

Lampetra lamottei (Lesueur) 1827 - American brook lamprey
Que., Ont.
Formerly *Entosphenus lamottei* (Lesueur).

Lampetra richardsoni Vladykov and Follett 1965 - western brook lamprey
B.C.
Formerly *L. planeri* (Bloch) which should be limited to the European brook lamprey from which the western brook lamprey is distinct (Vladykov and Follett, 1965).

Petromyzon marinus Linnaeus 1758 - sea lamprey
Nfld., N.S., P.E.I., N.B., Que., Ont.

Class OSTEICHTHYES (Pisces)

Order ACIPENSERIFORMES (Chondrostei)

f. Acipenseridae - sturgeons

Acipenser brevirostrum Lesueur 1818 - shortnose sturgeon
N.B.
Specimens have been taken in the St. John River (Scott and Crossman, 1959; Magnin, 1963), and more by Gorham (pers. comm.).

Acipenser fulvescens Rafinesque 1817 - lake sturgeon
Que., Ont., Man., Sask., Alta.

Acipenser medirostris Ayres 1854 - green sturgeon
B.C., Alaska

Acipenser oxyrhynchus Mitchill 1815 - Atlantic sturgeon
Nfld., Lab., N.S., P.E.I., N.B., Que.
Magnin and Beaulieu (1963) and Magnin (1964) concluded that this species was distinct from *A. sturio*.

Acipenser transmontanus Richardson 1836 - white sturgeon
B.C., Alaska

Order LEPISOSTEIFORMES (Semionotiformes, Protospondyli, Ginglymodi)

f. Lepisosteidae - gars

Lepisosteus oculatus (Winchell) 1864 - spotted gar
Ont.
Formerly *L. productus* (Cope) 1865.

Lepisosteus osseus (Linnaeus) 1758 - longnose gar
Que., Ont.

Order AMIIFORMES (Halecomorphi)

f. Amiidae - bowfin

Amia calva Linnaeus 1766 - bowfin
Que., Ont.

Order CLUPEIFORMES (Isospondyli)

f. Clupeidae - herrings

Alosa aestivalis (Mitchill) 1815 - blueback herring
N.B.

Alosa pseudoharengus (Wilson) 1811 - alewife
Nfld., Lab., N.S., P.E.I., N.B., Que., Ont.

Alosa sapidissima (Wilson) 1811 - American shad
Nfld., N.S., P.E.I., N.B., Que., Ont., B.C.*, Alaska*

Dorosoma cepedianum (Lesueur) 1818 - gizzard shad
Que., Ont.

f. Salmonidae - salmons, trouts, whitefishes, and grayling

A previous list (Scott, 1958) used the family names Salmonidae, Coregonidae, and Thymallidae,but we have included the latter two under the one family, Salmonidae. For convenience, however, we are employing the widely recognized subfamily designations Salmoninae, Coregoninae, and Thymallinae. The genus *Leucichthys* becomes a subgenus of *Coregonus* in agreement with present usage. The genus *Prosopium* previously combined with *Coregonus* by some authors, (Eschmeyer and Bailey, 1955; Wilimovsky, 1954; Legendre, 1954) but retained in Scott 1958,was later reinstated (Norden, 1961).

subf. Salmoninae

Oncorhynchus gorbuscha (Walbaum) 1792 - pink salmon
Nfld.*?, Ont.*?, B.C., NWT., Y.T., Alaska

Oncorhynchus keta (Walbaum) 1792 - chum salmon
Ont.*?, B.C., NWT., Y.T., Alaska

Oncorhynchus kisutch (Walbaum) 1792 - coho salmon
Ont.*?, B.C., Y.T., Alaska
Ontario was included in previous lists on the basis of liberations in Lake Erie in 1933. It is included in this list on the basis of recent introductions into Ontario waters.

Oncorhynchus nerka (Walbaum) 1792 - sockeye salmon; kokanee
Ont.*, Alta.*?, B.C., Y.T., Alaska
Ontario is included on the basis of 1966 spawning runs of kokanee in streams tributary to Georgian Bay and Lake Huron, resulting from liberations in Ontario in 1964 and 1965. It was recently introduced into Alberta.

Oncorhynchus tshawytscha (Walbaum) 1792 - chinook salmon
Ont.*?, B.C., Y.T., Alaska

Salmo clarki Richardson 1836 - cutthroat trout; coastal cutthroat; Yellowstone cutthroat
Que.*, Alta., B.C., Alaska
The coastal cutthroat trout, *S. c. clarki* Richardson 1836, and the Yellowstone cutthroat trout, *S. c. lewisi* (Girard) 1856 are considered here as components of the same species following the AFS list. See Qadri (1959) for a statement of distinctions.

Salmo gairdneri Richardson 1836 - steelhead trout; rainbow trout; Kamloops trout
(Nfld., N.S., P.E.I., N.B., Que., Ont., Man., Sask.)*, Alta., B.C., Y.T., Alaska

Salmo salar Linnaeus 1758 - Atlantic salmon; lake Atlantic salmon; ouananiche
Nfld., Lab., N.S., P.E.I., N.B., Que., Ont.*
Although originally native to Lake Ontario, current Ontario stocks result from introductions.

Salmo trutta Linnaeus 1758 - brown trout
(Nfld., N.S., N.B., Que., Ont., Man., Sask., Alta., B.C.)*

Salvelinus alpinus (Linnaeus) 1758 - Arctic char
Nfld., Lab., N.B., Que., Ont., Man., NWT., Y.T., Alaska
Clarification of the distinction of *S. alpinus* and *S. malma* is given in McPhail (1961) who also placed *S. marstoni*, the Quebec red trout, *S. oquossa* and *S. aureolus* within the synonymy of *S. alpinus*.

Salvelinus fontinalis (Mitchill) 1814 - brook trout
Nfld., Lab., N.S., P.E.I., N.B., Que., Ont., Man., Sask.*, Alta.*, B.C.*, Alaska*

The aurora trout, *Salvelinus timagamiensis* Henn and Rinkenbach 1925, is here considered conspecific with *S. fontinalis* (see Sale, 1967).

The splake or wendigo is an artificial hybrid form for which *Salvelinus fontinalis* is the male parent. See lake trout.

Salvelinus malma (Walbaum) 1792 - Dolly Varden
Alta., B.C., NWT., Y.T., Alaska

See *S. alpinus* and McPhail, 1961.

Salvelinus namaycush (Walbaum) 1792 - lake trout
Lab., N.S., N.B., Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T., Alaska

Although a hybrid rather than a distinct species, the splake or wendigo is now an important fish. It is the result of hybridizing male *Salvelinus fontinalis* and female *Salvelinus namaycush*.

subf. Coregoninae

Coregonus alpenae (Koelz) 1924 - longjaw cisco
Ont.

Coregonus artedii Lesueur 1818 - cisco; lake herring (tullibee in western Canada)
Que., Ont., Man., Sask., Alta., NWT.

Western Canada populations are perhaps best regarded as "*C. artedii* complex" (McPhail and Lindsey, pers. comm.).

Coregonus autumnalis (Pallas) 1776 - Arctic cisco
NWT., Y.T., Alaska

Previously called lauretta herring. See McPhail (1966) for discussion of *C. laurettae* and *C. autumnalis*.

Coregonus clupeaformis (Mitchill) 1818 - lake whitefish
Nfld.*, Lab., N.B., Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T., Alaska

Following the suggestion of Lindsey (pers. comm.) we treat here a possible complex of three forms: the broadly distributed lake whitefish, *C. clupeaformis*; the humpback whitefish, *C. pidschian* Gmelin 1788 of Alaska coastal waters and *C. nelsoni* Bean 1884. Lindsey (1963) validated *C. nelsoni* as a separate species occurring in the NWT. and Y.T. and later suggested the common name Yukon whitefish.

Coregonus hoyi (Gill) 1872 - bloater
Ont.

Coregonus johannae (Wagner) 1910 - deepwater cisco
Ont.

Coregonus kiyi (Koelz) 1921 - kiyi
Ont.

Coregonus laurettae Bean 1882 - Bering cisco
Alaska
See McPhail (1966) for discussion of this and *C. autumnalis* complex. Our 1967 list used lauretta as the common name. McPhail and Lindsey (in press) propose the name Bering cisco.

Coregonus nasus (Pallas) 1776 - broad whitefish
B.C., NWT., Y.T., Alaska
See Lindsey (1962) for comments concerning taxonomy of this and other northwestern whitefishes.

Coregonus nigripinnis (Gill) 1872 - blackfin cisco
Ont., Man., Sask., Alta.

Coregonus nipigon (Koelz) 1925 - Nipigon cisco
Que., Ont., Man.

Coregonus reighardi (Koelz) 1924 - shortnose cisco
Ont.

Coregonus sardinella Valenciennes 1848 - least cisco
B.C., NWT., Y.T., Alaska

Coregonus zenithicus (Jordan and Evermann) 1909 - shortjaw cisco
Ont., Man., Sask., Alta., NWT.

Coregonus sp.
N.S.
New species, restricted to N.S. waters.

Prosopium coulteri (Eigenmann and Eigenmann) 1892 - pygmy whitefish
Ont., B.C., Y.T., Alaska

Prosopium cylindraceum (Pallas) 1784 - round whitefish
Lab., N.B., Que., Ont., Man., Sask., B.C., NWT., Y.T., Alaska

Prosopium williamsoni (Girard) 1856 - mountain whitefish
Alta., B.C., Y.T.
P. oregonium is here considered to be a synonym of *P. williamsoni*. See Holt (1960) for a comparative study.

Stenodus leucichthys (Güldenstadt) 1772 - inconnu
B.C., NWT., Y.T., Alaska

subf. Thymallinae

Thymallus arcticus (Pallas) 1776 - Arctic grayling
Que.*?, Ont.*?, Man., Sask., Alta., B.C., NWT., Y.T., Alaska

f. Osmeridae - smelts

Hypomesus olidus (Pallas) 1814 - pond smelt
NWT., Y.T., Alaska

Osmerus eperlanus Linnaeus 1758 - rainbow smelt
Nfld., Lab., N.S., P.E.I., N.B., Que., Ont., B.C., NWT., Y.T., Alaska
This form constitutes a perlexing complex in North America. In 1967 we listed *O. eperlanus* Linnaeus, rainbow smelt for the western and arctic populations and *O. mordax* (Mitchill), American smelt,for the eastern populations. The arctic population had been referred to previously as *O. dentex* Steindachner, and as *O. e. dentex* by Wynne-Edwards(1952) and Walters (1955). McAllister (1963) synonymized *O. dentex* with *O. mordax*. We recognize here, the great difficulty of artificially separating individuals from the arctic and eastern populations and call them one species. However, as a result of the overwhelming geographic separation it would seem useful to retain the subspecific designations *O. e. dentex*, Arctic smelt and *O. e. mordax*, American smelt.

Spirinchus thaleichthys (Ayres) 1860 - longfin smelt
B.C.
McAllister (1963) referred the longfin smelt, *Spirinchus dilatus* Schultz and Chapman 1934, to the synonymy of the Sacramento smelt, *Spirinchus thaleichthys* and recommended the common name, longfin smelt.

Thaleichthys pacificus (Richardson) 1836 - eulachon
B.C., Alaska

f. Hiodontidae - mooneyes

Hiodon alosoides (Rafinesque) 1819 - goldeye
Que., Ont., Man., Sask., Alta., B.C., NWT.

Hiodon tergisus Lesueur 1818 - mooneye
Que., Ont., Man., Sask.

f. Umbridae - mudminnows

Dallia pectoralis Bean 1880 - Alaska blackfish
Ont.*?, Alaska
The genus *Dallia* previously listed in the family Dalliidae is currently considered to be insufficiently distinct from the genus *Umbra* to warrant family designation.

Umbra limi (Kirtland) 1840 - central mudminnow
Que., Ont., Man., Sask.

f. Esocidae - pikes

Esox americanus Gmelin 1788 - redfin and grass pickerels
Que., Ont.
The redfin and grass pickerels, previously listed as separate species, were considered by Crossman (1966) to be only subspecifically distinct, i.e. *E. a. americanus* Gmelin, the redfin pickerel and *E. a. vermiculatus* Lesueur 1846, the grass pickerel.

Esox lucius Linnaeus 1758 - northern pike
Lab., Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T., Alaska

Esox masquinongy Mitchill 1824 - muskellunge
Que., Ont., Man.

Esox niger Lesueur 1818 - chain pickerel
N.S.*, N.B., Que.

Order CYPRINIFORMES (Ostariophysi)

f. Cyprinidae - minnows

Acrocheilus alutaceus Agassiz and Pickering 1855 - chiselmouth
B.C.
Previously spelled *A. alutaceum*.

Carassius auratus (Linnaeus) 1758 - goldfish
(Ont., Alta., B.C.)*

Chrosomus eos Cope 1862 - northern redbelly dace
N.S., P.E.I., N.B., Que., Ont., Man., Sask., Alta., B.C.

Chrosomus neogaeus (Cope) 1866 - finescale dace
N.B., Que., Ont., Man., Sask., Alta., B.C., NWT.
Formerly *Pfrille neogaea* (Cope). Many authors following Bailey (1951) have enlarged the genus *Chrosomus* to include this species.

Clinostomus elongatus (Kirtland) 1836 - redside dace
Ont.

Couesius plumbeus (Agassiz) 1850 - lake chub
Lab., N.S., N.B., Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T., Alaska
Many authors following Bailey (1951) have enlarged the genus *Hybopsis* to include the genera *Couesius, Nocomis, Erimystax* and *Platygobio*. However, we prefer to retain *Couesius, Nocomis* and *Platygobio*.

Cyprinus carpio Linnaeus 1758 - carp
(Que., Ont., Man., Sask., B.C.)*

Exoglossum maxillingua (Lesueur) 1817 - cutlips minnow
Que., Ont.

Hybognathus hankinsoni Hubbs 1929 - brassy minnow
Que., Ont., Man., Sask., Alta., B.C.

Hybognathus nuchalis Agassiz 1855 - silvery minnow
Que., Ont., Alta.

Hybopsis storeriana (Kirtland) 1842 - silver chub
Ont., Man.

Hybopsis x-punctata Hubbs and Crowe 1956 - gravel chub
Ont.
Formerly *Erimystax dissimilis* (Kirtland) 1841; see *Couesius plumbeus* above concerning genus. Hubbs and Crowe (1956) established this new name for the gravel chub.

Mylocheilus caurinus (Richardson) 1836 - peamouth
Alta., B.C.
Previously spelled *M. caurinum*.

Nocomis biguttatus (Kirtland) 1840 - hornyhead chub
Que., Ont., Man.
Formerly *Hybopsis biguttata* (Kirtland); see *Couesius plumbeus* above.

Nocomis micropogon (Cope) 1864 - river chub
Ont.
Formerly *Hybopsis micropogon* (Cope); see *Couesius plumbeus* above.

Notemigonus crysoleucas (Mitchill) 1814 - golden shiner
N.S., P.E.I.*, N.B., Que., Ont., Man., Sask.

Notropis anogenus Forbes 1885 - pugnose shiner
Ont.

Notropis atherinoides Rafinesque 1818 - emerald shiner
Que., Ont., Man., Sask., Alta., B.C., NWT.

Notropis bifrenatus (Cope) 1867 - bridle shiner
Que., Ont.

Notropis blennius (Girard) 1856 - river shiner
Man., Sask., Alta.

Notropis chrysocephalus (Rafinesque) 1820 - striped shiner
Ont.
Recently considered a subspecies of *N. cornutus* but re-erected to species by Gilbert (1964) who called it striped shiner. It is not included in the 1960 AFS list. Cross (1967) listed it but called it central common shiner.

Notropis cornutus (Mitchill) 1817 - common shiner
N.S., N.B., Que., Ont., Man., Sask.

Notropis heterodon (Cope) 1864 - blackchin shiner
Que., Ont.

Notropis heterolepis Eigenmann and Eigenmann 1893 - blacknose shiner
N.S., N.B., Que., Ont., Man., Sask.

Notropis hudsonius (Clinton) 1824 - spottail shiner
Que., Ont., Man., Sask., Alta., NWT.

Notropis rubellus (Agassiz) 1850 - rosyface shiner
Que., Ont., Man.

Notropis spilopterus (Cope) 1866 - spotfin shiner
Que., Ont.

Notropis stramineus (Cope) 1864 - sand shiner
Que., Ont., Man., Sask.
Formerly *Notropis deliciosus* (Girard) 1856. The specimens on which *Notropis deliciosus* was based were in effect *N. texanus* (Girard). The next available name for the species is *stramineus* (Suttkus, 1958).

Notropis umbratilis (Girard) 1856 - redfin shiner
Ont.

Notropis volucellus (Cope) 1864 - mimic shiner
Que., Ont., Man.

Opsopoeodus emiliae Hay 1880 - pugnose minnow
Ont.

Pimephales notatus (Rafinesque) 1820 - bluntnose minnow
Que., Ont., Man.

Pimephales promelas Rafinesque 1820 - fathead minnow
N.B., Que., Ont., Man., Sask., Alta., NWT.

Platygobio gracilis (Richardson) 1836 - flathead chub
Man., Sask., Alta., B.C., NWT., Y.T.

Ptychocheilus oregonensis (Richardson) 1836 - northern squawfish
B.C., Alta.
Previously spelled *P. oregonense*.

Rhinichthys atratulus (Hermann) 1804 - blacknose dace
N.S., N.B., Que., Ont., Man.

Rhinichthys cataractae (Valenciennes) 1842 - longnose dace
Lab., Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T.

Rhinichthys falcatus (Eigenmann and Eigenmann) 1893 - leopard dace
B.C.

Rhinichthys osculus (Girard) 1856 - speckled dace
B.C.

Richardsonius balteatus (Richardson) 1836 - redside shiner
Alta., B.C.

Semotilus atromaculatus (Mitchill) 1818 - creek chub
N.S., N.B., Que., Ont., Man.

Semotilus corporalis (Mitchill) 1817 - fallfish
N.B., Que., Ont.

Semotilus margarita (Cope) 1866 - pearl dace
N.S., N.B., Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T.
Formerly *Margariscus margarita nachtriebei* (Cox) 1894.

Tinca tinca (Linnaeus) 1758 - tench
B.C.*

f. Catostomidae - suckers

Carpiodes cyprinus (Lesueur) 1817 - quillback
Que., Ont., Man., Sask., Alta.

Catostomus catostomus (Forster) 1773 - longnose sucker
Lab., N.B., Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T., Alaska

Catostomus columbianus (Eigenmann and Eigenmann) 1893 - bridgelip sucker
B.C.

Catostomus commersoni (Lacépède) 1803 - white sucker
Lab., N.S., N.B., Que., Ont., Man., Sask., Alta., B.C., NWT.

Catostomus macrocheilus Girard 1856 - largescale sucker
Alta., B.C.

Catostomus platyrhynchus (Cope) 1874 - mountain sucker
Sask., Alta., B.C.
Formerly *Pantosteus jordani* Evermann, 1893. Smith (1966) considered *Pantosteus* characteristics to be only of subgeneric rank within the genus *Catostomus*. He synonymized *P. platyrhynchus* Cope 1874, *P. jordani* Evermann 1893 and *P. lahontan* Rutter 1903 under the oldest specific name. The adjective, northern, is no longer appropriate.

Erimyzon sucetta (Lacépède) 1803 - lake chubsucker
Ont.

Hypentelium nigricans (Lesueur) 1817 - northern hogsucker
Ont.

Ictiobus cyprinellus (Valenciennes) 1844 - bigmouth buffalo
Ont., Man., Sask.
Formerly *Megastomatobus cyprinella.* Note that *Ictiobus bubalus* (Rafinesque) 1819, the smallmouth buffalo, is omitted. Scott (1958) noted that Halkett's (1913) checklist was the only basis for subsequent listings and that no valid Canadian record exists.

Minytrema melanops (Rafinesque) 1820 - spotted sucker
Ont.
Long known in U.S. tributaries of the Great Lakes, this species was first taken from Canadian waters of Lake St. Clair in 1962 (Crossman and Ferguson, 1963).

Moxostoma anisurum (Rafinesque) 1820 - silver redhorse
Que., Ont., Man., Sask., Alta.

Moxostoma carinatum (Cope) 1870 - river redhorse
Que., Ont.

Moxostoma duquesnei (Lesueur) 1817 - black redhorse
Ont.

Moxostoma erythrurum (Rafinesque) 1818 - golden redhorse
Ont.

Moxostoma hubbsi Legendre 1942 - copper redhorse
Que.

Moxostoma macrolepidotum (Lesueur) 1817 - northern redhorse
Que., Ont., Man., Sask., Alta.
Formerly *Moxostoma aureolum* (Lesueur).

Moxostoma valenciennesi Jordan 1885 - greater redhorse
Que., Ont.

f. Ictaluridae - catfishes

Ictalurus melas (Rafinesque) 1820 - black bullhead
Ont., Man., Sask., B.C.*

Ictalurus natalis (Lesueur) 1819 - yellow bullhead
Ont.

Ictalurus nebulosus (Lesueur) 1819 - brown bullhead
N.S., N.B., Que., Ont., Man., Sask., B.C.*

Ictalurus punctatus (Rafinesque) 1818 - channel catfish
Que., Ont., Man.

Noturus flavus Rafinesque 1818 - stonecat
Que., Ont., Alta.

Noturus gyrinus (Mitchill) 1818 - tadpole madtom
Que., Ont., Man., Sask.
Formerly *Schilbeodes gyrinus* (Mitchill).

Noturus miurus Jordan 1877 - brindled madtom
Ont.
Formerly *Schilbeodes miurus* (Jordan).

Order ANGUILLIFORMES (Apodes)

f. Anguillidae - freshwater eels

Anguilla rostrata (Lesueur) 1817 - American eel
Nfld., Lab., N.S., P.E.I., N.B., Que., Ont.

Order CYPRINODONTIFORMES (Mycrocyprini)

f. Cyprinodontidae - killifishes

Fundulus diaphanus (Lesueur) 1817 - banded killifish
Nfld., N.S., P.E.I., N.B., Que., Ont., Man.

Fundulus heteroclitus (Linnaeus) 1766 - mummichog
Nfld., N.S., P.E.I., N.B., Que.

Gambusia affinis (Baird and Girard) 1853 - mosquitofish
Alta.
Paetz and Nelson (1968) stated that this species was introduced into the outflow of Cave and Basin Hotsprings in 1924 for mosquito control and that the population still exists.

Order GADIFORMES (Anacanthini)

f. Gadidae - cods

Lota lota (Linnaeus) 1758 - burbot
Lab., N.B., Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T., Alaska

Microgadus tomcod (Walbaum) 1792 - Atlantic tomcod
Nfld., Lab., N.S., P.E.I., N.B., Que.

Order ATHERINIFORMES

f. Atherinidae - silversides

Labidesthes sicculus (Cope) 1865 - brook silverside
Que., Ont.

Order GASTEROSTEIFORMES (Thoracostei)

f. Gasterosteidae - sticklebacks

Apeltes quadracus (Mitchill) 1815 - fourspine stickleback
Nfld., N.S., P.E.I., N.B., Que.

Culaea inconstans (Kirtland) 1841 - brook stickleback
N.B., Que., Ont., Man., Sask., Alta., B.C., NWT.
Formerly *Eucalia inconstans*. The generic name *Eucalia* was pre-occupied and the new generic name was proposed by Whitley (1950).

Gasterosteus aculeatus Linnaeus 1758 - threespine stickleback
Nfld., Lab., N.S., P.E.I., N.B., Que., Ont., B.C., NWT., Alaska

Gasterosteus wheatlandi Putnam 1867 - blackspot stickleback
Nfld., N.B., Que.
This species, not previously listed and often confused with *G. aculeatus*, was reported from Quebec by McAllister (1960) and from Newfoundland by Scott and Crossman (1964). The name blackspot stickleback is preferred, since twospine is inaccurate.

Pungitius pungitius (Linnaeus) 1758 - ninespine stickleback
Nfld., Lab., N.S., P.E.I., N.B., Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T., Alaska

Order PERCOPSIFORMES (Salmopercae)

f. Percopsidae - trout-perches

Percopsis omiscomaycus (Walbaum) 1792 - trout-perch
Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T., Alaska

Order PERCIFORMES (Percomorphi)

f. Serranidae - basses

Roccus americanus (Gmelin) 1789 - white perch
N.S., P.E.I., N.B., Que., Ont.

Roccus chrysops (Rafinesque) 1820 - white bass
Que., Ont.

Roccus saxatilis (Walbaum) 1792 - striped bass
N.S., P.E.I., N.B., Que.

f. Centrarchidae - sunfishes

Ambloplites rupestris (Rafinesque) 1817 - rock bass
Que., Ont., Man., Sask.

Lepomis auritus (Linnaeus) 1758 - redbreast sunfish
N.B.
Formerly yellowbelly sunfish.

Lepomis cyanellus Rafinesque 1819 - green sunfish
Ont.

Lepomis gibbosus (Linnaeus) 1758 - pumpkinseed
N.B., Que., Ont., Man., B.C.*

Lepomis macrochirus Rafinesque 1819 - bluegill
Que., Ont.

Lepomis megalotis (Rafinesque) 1820 - longear sunfish
Que., Ont.

Micropterus dolomieui Lacépède 1802 - smallmouth bass
N.S.*, N.B.*, Que., Ont., Man.*, Sask.*, B.C.*

Micropterus salmoides (Lacépède) 1802 - largemouth bass
Que., Ont., Man.*, Sask.*, B.C.*

Pomoxis annularis Rafinesque 1818 - white crappie
Ont.

Pomoxis nigromaculatus (Lesueur) 1829 - black crappie
Que., Ont., Man., B.C.*

f. Percidae - perches

Ammocrypta pellucida (Baird) 1863 - sand darter
Que., Ont.

Etheostoma blennioides Rafinesque 1819 - greenside darter
Ont.

Etheostoma caeruleum Storer 1845 - rainbow darter
Que., Ont.

Etheostoma exile (Girard) 1859 - Iowa darter
Que., Ont., Man., Sask., Alta.

Etheostoma flabellare Rafinesque 1819 - fantail darter
Que., Ont.

Etheostoma microperca Jordan and Gilbert 1888 - least darter
Ont.

Etheostoma nigrum Rafinesque 1820 - Central Johnny darter
Que., Ont., Man., Sask.
Etheostoma (Boleosoma) nigrum was represented in North America by three subspecies, all occurring in Canada: *E. n. olmstedi* - Maritimes to eastern Lake Ontario; *E. n. eulepis* - Great Lakes basin; and *E. n. nigrum* - Saskatchewan to western Quebec. *E. olmstedi* Storer (as a full species) was proposed by Cole (1967) but its status in Canadian waters is ill defined.

Perca flavescens (Mitchill) 1814 - yellow perch
N.S., N.B., Que., Ont., Man., Sask., Alta., B.C., NWT.
Formerly *Perca fluviatilis* Linnaeus 1758. Svetovidov and Dorofeeva (1963) synonymized the new and old world perches. *P. flavescens* is retained here, pending clarification.

Percina caprodes (Rafinesque) 1818 - logperch
Que., Ont., Man., Sask.

Percina copelandi (Jordan) 1877 - channel darter
Que., Ont.

Percina maculata (Girard) 1859 - blackside darter
Ont., Man., Sask

Percina shumardi (Girard) 1859 - river darter
Ont., Man.

Stizostedion canadense (Smith) 1836 - sauger
Que., Ont., Man., Sask., Alta.

Stizostedion vitreum (Mitchill) 1818 - walleye
Que., Ont., Man., Sask., Alta., B.C., NWT.
Previous list showed the yellow walleye and the blue pike, *Stizostedion vitreum glaucum* Hubbs 1926 as separate entities. *S. v. glaucum* is now considered to be extinct.

f. Sciaenidae - drums

Aplodinotus grunniens Rafinesque 1819 - freshwater drum
Que., Ont., Man., Sask.

f. Cottidae - sculpins

Cottus aleuticus Gilbert 1893 - coastrange sculpin
B.C., Alaska
Formerly Aleutian sculpin.

Cottus asper Richardson 1836 - prickly sculpin
B.C., Alaska

Cottus bairdi Girard 1850 - mottled sculpin
Lab., Que., Ont., Man., Sask., Alta., B.C., NWT.
The species previously reported for B.C. as *Cottus hubbsi* Bailey and Dimick 1949 has now been synonymized with *C. bairdi* (see Bailey and Bond, 1963).

Cottus cognatus Richardson 1836 - slimy sculpin
Lab., N.B., Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T., Alaska
The species previously listed for B.C. as *C. philonips* Eigenmann and Eigenmann 1892, has been shown to be a synonym of *C. cognatus* (see McAllister and Lindsey 1959).

Cottus confusus Bailey and Bond 1963 - shorthead sculpin
B.C.

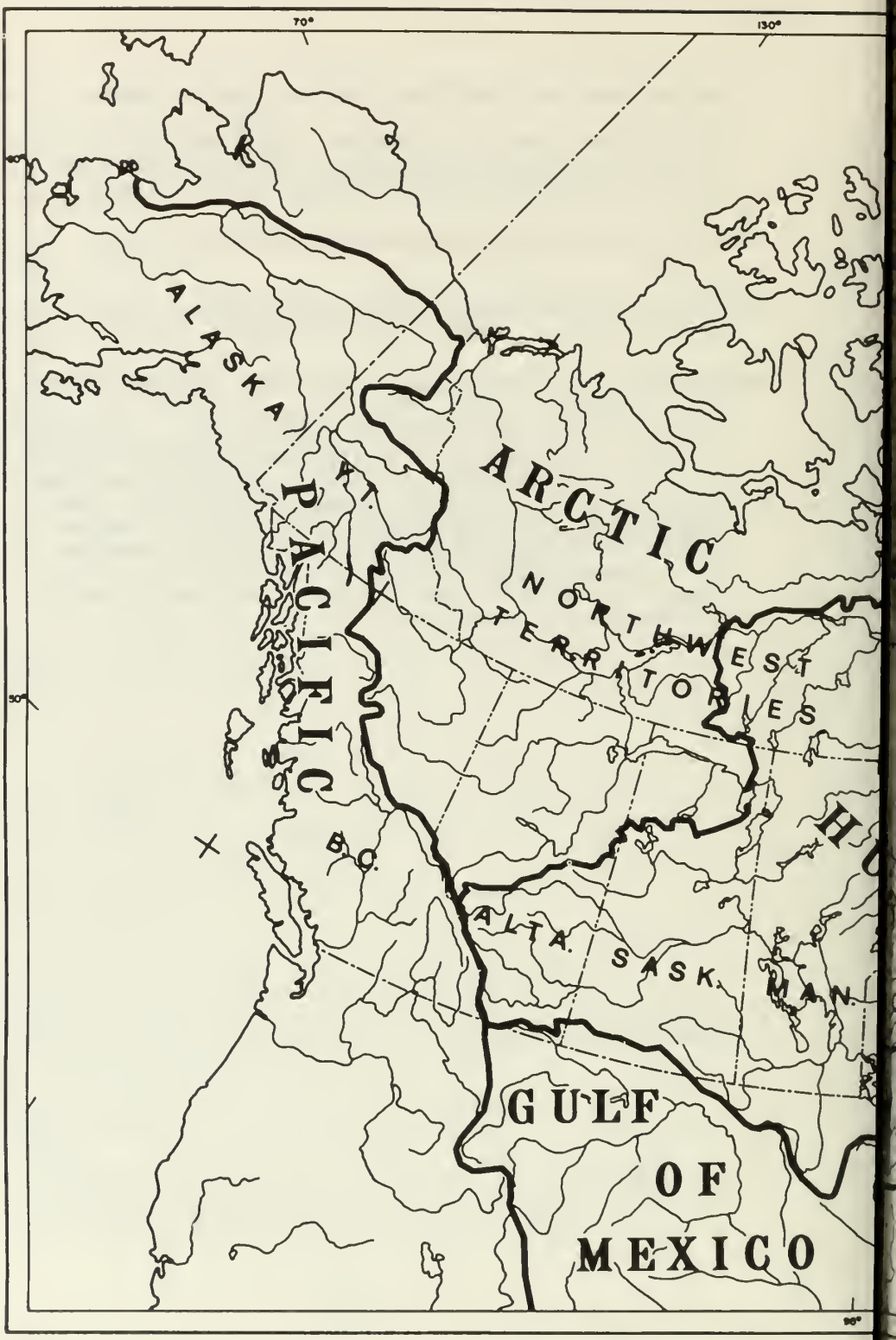
Previously reported by McAllister and Lindsey (1961) as *Cottus* sp. from the Flathead River, B.C. Its status as a new species was clarified by Bailey and Bond (1963).

Cottus rhotheus (Smith) 1882 - torrent sculpin
B.C.

Cottus ricei (Nelson) 1876 - spoonhead sculpin
Que., Ont., Man., Sask., Alta., B.C., NWT., Y.T.

Myoxocephalus quadricornis (Linnaeus) 1758 - deepwater sculpin
Que., Ont., Man., Sask., NWT.

Formerly *Triglopsis thompsoni* (Girard) 1852. This species was for a time considered a subspecies, *thompsoni* of the species *M. quadricornis*. McAllister (1959b) gave evidence for elevating it to specific status, *M. thompsoni*. More recently, on the basis of possible intermediates in the Arctic the tendency is once more to call it a subspecies of *M. quadricornis*. Until its taxonomic position is clarified it seems appropriate to leave as above but to retain the distinctive common name.


70°
130°
ALASKA
ARCTIC
PACIFIC
NORTHWEST
TERRITORIES
B.C.
ALTA.
SASK.
MAN.
GULF
OF
MEXICO
50°
90°

WATERSHED MAP OF CANADA
200
0
200
400
600
MILES
NEWFOUNDLAND
BAY
ATLANTIC
P.E.I.
N.B.
N.S.
ON
ONT.

KEY TO THE FAMILIES OF FISHES
OCCURRING IN THE FRESH WATERS OF CANADA

1 Mouth without true jaws, instead a circular, suctorial disc; no paired fins; 7 pairs of gill openings.
Lampreys, family Petromyzontidae (p. 31)

Mouth with true jaws (i.e. upper and lower jaws present); with paired fins; opercles (or gill covers) overlying gills 2

2 Upper and lower lobe of caudal (tail) fin, when present, of about equal size; body covering of overlapping scales or naked; no barbels before mouth; skeleton bony 3

Upper lobe of caudal (tail) fin distinctly larger than lower lobe; mouth inferior, snout well developed but not paddle-like; 5 rows of bony plates arranged longitudinally along body; 4 pairs of barbels before mouth.
Sturgeons, family Acipenseridae (p. 33)

3 Under surface of head, between lower jaws, with strong bony plate ("gular" plate).
Bowfins, family Amiidae

Under surface of head (i.e. between the lower jaws) soft and not protected by large bony plate 4

4 Pelvic fins present 5

Pelvic fins absent, body cylindrical, long and snake-like; dorsal, caudal and anal fins continuous; no distinct caudal fin.
Eels, family Anguillidae

5 Adipose fin present 6

Adipose fin absent 11

6 Body scaleless; strong pectoral and dorsal spines; long barbels about mouth.
Catfishes, family Ictaluridae (p. 59)

Body scaled, no strong spines in fins; no long barbels about mouth 7

7 Pectoral fin overlaps anterior pelvic base; scales (weakly) ctenoid.
Trout-perch, family Percopsidae

Pectoral fin tip never reaches anterior base of pelvic fin; scales cycloid 8

8 Pelvic axillary process absent.
Smelts, family Osmeridae (p. 42)

Pelvic axillary process present..... 9

9 Mouth usually large, extending to middle of eye or beyond; teeth strong.
Salmons and trouts, (Salmoninae), family Salmonidae (p. 36)

Mouth usually small and not extending beyond middle of eye; teeth weak or absent 10

10 Dorsal fin base shorter than head, dorsal rays 16 or fewer.
Whitefishes, ciscoes, (Coregoninae), family Salmonidae (p. 36)

Dorsal fin base longer than head, fin very high, rays 17 or more.
Grayling, (Thymallinae), family Salmonidae

11 Pelvic fins abdominal, or apparently so, (posterior to pectoral fins, except Gasterosteidae) 12

Pelvic fins thoracic or jugular (below or anterior to pectoral fins) 20

12 A single soft dorsal fin present, not preceded by spines 13

Soft dorsal fin preceded by 3-10 isolated spines or by a separate spiny dorsal or 4 slender, inconspicuous spines 25

13 Body covered with thick, hard, glossy rhomboid scales.
Gar pikes, family Lepisosteidae (p. 34)

Body normally scaled or with scattered prickles or narrow plates 14

14 Gill membranes not attached to isthmus (gill openings wide) 15

Gill membranes broadly joined to isthmus (gill openings narrow) 18

15 Head with some scales; body elongate; spotted, barred or dark coloured 16

Head without scales; body laterally compressed; silvery 19

16 Upper jaw protractile.
Killifishes, family Cyprinodontidae (p. 61)

Upper jaw not protractile 17

17 Jaws well developed; teeth strong; caudal fin forked.
Pikes, family Esocidae (p. 43)

Jaws short; teeth small; caudal fin rounded.
Mudminnows, blackfish, family Umbridae (p. 43)

18 Lips usually thick and mouth inferior, (except *Ictiobus* where it is oblique and with normal lips; however in *Ictiobus* the long dorsal fin has over 28 rays, and the longest unbranched ray is not a serrate, heavy, spine thus separating it from the two cyprinids with long dorsal rays, *Cyprinus* and *Carassius*); pharyngeal teeth numerous and in one row, comb-like; swim bladder of 2 or 3 chambers.

Suckers, family Catostomidae (p. 54)

Lips thin, mouth seldom inferior, (except in *Rhinichthys* where scales are minute and much smaller than in suckers); dorsal fin long, no more than 22 rays and second unbranched element a heavy serrate spine; pharyngeal teeth in 2 or 3 rows, fewer than 9 per side; swim bladder of one chamber.

Minnows, family Cyprinidae (p. 45)

19 Lateral line absent; teeth absent, belly with sharp pointed scales; dorsal fin situated over pelvic fins and well in advance of anal fin; never more than 24 anal rays.

Herrings, family Clupeidae (p. 35)

Lateral line present, at times indistinct; teeth present; no sharp, pointed scales on belly, belly fleshy instead; dorsal fin over anal fin and well behind pelvic fins; always more than 25 anal rays.

Mooneyes, family Hiodontidae (p. 43)

20 Body plated, naked or with prickles; pectoral fins large and conspicuous.

Sculpins, family Cottidae (p. 72)

Body scaled (scales small and somewhat embedded in Gadidae); pectoral fins of moderate size, not conspicuous 21

21 Chin with small but distinct median barbel.
Cods, family Gadidae (p. 62)

Chin without small median barbel 22

22 Anal spines one or two 23

Anal spines 3 or more 24

23 Second anal spine strong and stout and conspicuously larger than first; lateral line extending onto caudal fin.
Drums, family Sciaenidae

Second anal spine slender and not conspicuously larger than first; lateral line not extending onto caudal fin.
Perches, family Percidae (p. 67)

24 Opercle with a spine; 3 anal spines; pseudobranch well developed and obvious.
Basses, family Serranidae (p. 63)

Opercle without a spine; 3 or more anal spines; pseudobranch concealed or absent.
Sunfishes, family Centrarchidae (p. 64)

25 Strong pelvic spines present; caudal fin rounded or slightly forked.
Sticklebacks, family Gasterosteidae (p. 62)

Pelvic fins without spines; caudal fin forked.
Silversides, family Atherinidae

KEY TO THE SPECIES OF THE FAMILY PETROMYZONTIDAE

(TRANSFORMED* LAMPREYS)

1 Dorsal fin composed of two obvious lobes; lobes separated, or joined by very low and inconspicuous connection 2

Dorsal fin single but notched, notch never reaching dorsal surface of body 8

2 Supraoral teeth on broad curved bar (lamina) 3

Supraoral teeth not on broad curved bar (lamina) but consisting of a single, median, large, bicuspid tooth, with pointed cusps; laterals 4, bicuspid, pointed cusps; trunk myomeres 67-74; parasitic; to 860 mm in length.
Sea lamprey, *Petromyzon marinus*

3 Supraoral lamina with 2 lateral cusps, no median cusp 4

Supraoral lamina with 3 prominent, sharp cusps, one median; lateral teeth 3 or 4 with at least the middle 2 on each side tricuspid, others bicuspid, or tricuspid; semicircular row of small teeth below infraoral bar; trunk myomeres 64-74; parasitic; to 680 mm in length.
Pacific lamprey, *Lampetra tridentata*

4 Inner lateral teeth bicuspid or tricuspid 5

Inner lateral teeth 3, unicuspid, prominent, conical, blunt; infraoral bar with 6-8, blunt, rounded teeth; trunk myomeres 70-74; parasitic; to 280 mm in total length.
Arctic lamprey, *Lampetra japonica*

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* This key is intended only for transformed individuals. The identification of immature lampreys (larvae or ammocoetes, with an oral hood) requires much more detail.

5 Inner lateral teeth 3, at least middle one on both sides bicuspid 6

Inner lateral teeth 3, at least middle tooth on both sides tricuspid (rarely middle lateral on one or both sides tricuspid in *Lampetra richardsoni*)..... 7

6 Inner lateral teeth prominent, bluntly pointed, all bicuspid; teeth above supraoral bar prominent, sharply pointed; tongue with sharp teeth; trunk myomeres 64-70; non-parasitic; length to 187 mm.
American brook lamprey, *Lampetra lamottei*

Inner lateral teeth poorly defined, knob-like, some may be unicuspid; teeth above supraoral bar (anterials), if apparent, very small and peg-like; no sharp teeth on tongue; trunk myomeres 60-70; non-parasitic; length to 154 mm.
Western brook lamprey, *Lampetra richardsoni*

7 Teeth above supraoral lamina (anterials) prominent and sharp; sharp teeth on tongue; trunk myomeres 63-71; parasitic; length to 311 mm.
River lamprey, *Lampetra ayresi*

Teeth above supraoral lamina (anterials), if apparent, very small and peg-like; no sharp teeth on tongue; trunk myomeres 60-70; non-parasitic; length to 154 mm.
Western brook lamprey, *Lampetra richardsoni*

8 Lateral teeth all unicuspid 9

At least one or more bicuspid inner lateral teeth on each side, supraoral a single sharp bicuspid tooth; trunk myomeres 50-56; parasitic; to 380 mm in length.
Chestnut lamprey, *Ichthyomyzon castaneus*

9 Supraoral usually a single bicuspid tooth (one cusp rarely doubled), cusps sharp; infraoral lamina with prominent triangular cusps; diameter of sucking disc greater than that of branchial region; trunk myomeres 47-55; parasitic; length to 328 mm.
Silver lamprey, *Ichthyomyzon unicuspis*

Supraoral a single weak bicuspid tooth, cusps knob-like; infraoral lamina with low knob-like cusps; diameter of sucking disc less than that of branchial region; trunk myomeres 50-58; nonparasitic; length to 150 mm.
Northern brook lamprey, *Ichthyomyzon fossor*

KEY TO THE SPECIES OF THE FAMILY ACIPENSERIDAE

1 Obvious plates other than fulcral plates between dorsal fin and caudal fin, and between anal fin and caudal fin 2

No obvious plates behind dorsal or anal fin other than fulcral plates; 6-9 plates, mainly in two rows, between vent and anal fulcral; dorsal plates 11-14; lateral plates 38-48; to 20 ft. and 1800 lb.
White sturgeon, *Acipenser transmontanus*

2 One large plate between anal fin and caudal fulcral 3

Four smaller plates usually as two pairs, between anal fin and caudal fulcral, first pair may overlap base of anal fin, second pair may look like one plate; 6-9 plates, mostly in pairs, behind dorsal fin; dorsal plates 10-16; lateral plates 26-34; to 10 ft. and 300 lb.
Atlantic sturgeon, *Acipenser oxyrhynchus*

3 Distance from tip of snout to line of barbels equal to or slightly less than one half the distance from tip of snout to anterior edge of mouth, lip excluded; snout to barbels no more than 1.5 times distance from posterior margin of mouth, lips excluded, to isthmus; gill rakers 22-40 4

Distance from tip of snout to line of barbels more than one half the distance from tip of snout to anterior edge of mouth, lip excluded; snout to barbels over twice the distance from posterior edge of mouth, lip excluded, to isthmus; gill rakers 18-20; dorsal plates 8-11; lateral plates 23-30; to 7 ft. and 350 lb.

Green sturgeon, *Acipenser medirostris*

4 Anal fin rays 25-30; insertion of anal fin plainly behind insertion of dorsal fin; gill rakers 25-40 but usually 32-35; caudal peduncle longer, tip of anal fin reaching only to anterior edge of caudal fulcral plate; dorsal plates 9-17; lateral plates 29-42; to 7 ft. and 350 lb.

Lake sturgeon, *Acipenser fulvescens*

Anal fin rays 19-22; insertion of anal fin opposite insertion of dorsal fin; gill rakers 22-29; caudal peduncle shorter, tip of anal fin reaching origin of caudal fin; dorsal plates 8-11; lateral plates 22-33; to 36 inches and 9 lb.

Shortnose sturgeon, *Acipenser brevirostrum*

KEY TO THE SPECIES OF THE FAMILY LEPISOSTEIDAE

1 Snout long and narrow, least snout width into snout length 14-18 times; caudal peduncle shallow and long, least depth into length 2.3-2.9 times; lateral line

scales 61-65; spots on body apparent only from pelvic fin to caudal peduncle, spots on dorsal, anal and caudal fins.

Longnose gar, *Lepisosteus osseus*

Snout short and broad, least snout width into snout length 6-8 times; caudal peduncle deeper and shorter, depth into length 1.7-2.0 times; lateral line scales 46-50; body, head and all fins conspicuously spotted on epidermal layer over scales.

Spotted gar, *Lepisosteus productus*

KEY TO THE SPECIES OF THE FAMILY CLUPEIDAE

1 Last ray of dorsal fin protracted into a long filament; snout rounded, mouth slightly subterminal; anal rays more than 25.

Gizzard shad, *Dorosoma cepedianum*

Last ray of the dorsal fin the shortest ray; snout more or less pointed; mouth terminal; anal rays fewer than 25 2

2 Lower jaw, when closed, nearly equal to upper, and fits into notch in upper jaw; maxillary extends at least to posterior margin of eye; gill rakers more than 55; usually 4-6 black spots in horizontal row behind operculum.

American shad, *Alosa sapidissima*

Lower jaw, when closed, extending beyond upper jaw; maxillary extends only to midpoint of eye; gill rakers fewer than 55; one prominent black spot near upper rear edge of operculum 3

3 Eye diameter usually greater than snout length; peritoneum silvery.

Alewife, *Alosa pseudoharengus*

Eye diameter usually smaller than snout length; peritoneum darkly pigmented.

Blueback herring, *Alosa aestivalis*

KEY TO THE SPECIES OF THE FAMILY SALMONIDAE*

1 Scales small, those in lateral line 115-200; teeth well developed on jaws and vomer; caudal usually truncate, occasionally forked; young (6 inches or less) with dark vertical blotches (parr marks) on sides (except *O. gorbuscha*)
Salmons, trouts, chars (Salmoninae) 2

Scales large, those in lateral line 100 or less; teeth weakly developed or absent; caudal fin distinctly forked; parr marks usually absent (except *Prosopium* and *Thymallus*); colour generally silvery, silvery green, or silvery blue.
Whitefishes (Coregoninae) and grayling (Thymallinae) 14

2 Anal rays 13-19 (usually 14-16); body and caudal fin of adults with black spots.
Pacific salmons, *Oncorhynchus* spp. 10

Anal rays 7-12 (usually 9-11); body and caudal fin with or without black spots 3

3 Black spots present on head and body (young *S. salar* have red spots between parr marks); scales conspicuous, fewer than 165 in lateral line; pelvic and anal fins without white leading edges; vomer flat with teeth extended backward in 2 rows 4

Light spots, not black spots, on body, these spots being pink, red, or cream in colour; scales not conspicuous; lower fins with snow-white leading edges; vomer boat-shaped, teeth on the anterior part only 7

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* When in the sea, or in large lakes, body pigmentation is usually masked by heavy silvery colouration. The characters enumerated in the key will be evident if the specimen is examined carefully.

4 Caudal fin distinctly marked with radiating rows of black spots; body never with red spots; adipose often with black margin; scale rows 120-180 5

Caudal fin usually unspotted, but never with regular rows of black spots; reddish spots sometimes on body; scale rows usually 110-130 6

5 Red or orange-red dash on lower jaw, along inner border of mandible; minute teeth usually present at base of tongue (basibranchial teeth).
Cutthroat trout, *Salmo clarki*

No red colouration present on lower jaw; minute teeth at base of tongue absent.
Rainbow trout, *Salmo gairdneri*

6 Maxillary to below centre of eye in 6-inch fish, seldom far behind eye (except in large males); gill cover with 2 or 3 large spots only; branchiostegals usually 12; dorsal fin rays usually 11; vomerine teeth usually not well developed; small fish have red spots between parr marks; no red on adipose fin.
Atlantic salmon, *Salmo salar*

Maxillary to below last half of eye on 5-inch fish, and extending well beyond eye in larger fish; gill cover usually with many spots; branchiostegals usually 10; dorsal fin rays usually 9; vomerine teeth well developed; rust-red spots sometimes on adults and often on margin of adipose fin.
Brown trout, *Salmo trutta*

7 Caudal fin deeply forked; dorsal and caudal fins, body and head covered with small, often bean-shaped light spots, body never brightly coloured

with orange or red; parr marks quite irregular, and narrow; pyloric caecae over 90.
Lake trout, *Salvelinus namaycush*

Caudal fin square (truncate) or slightly forked, body with light-coloured spots of cream, pink, or red; dorsal and caudal fins with dark wavy lines and marks, or unspotted, without light spots; pyloric caecae less than 75 8

8 Caudal fin square or nearly so; dorsal and caudal fins with distinct, dark wavy lines or blotches; lower fins with pure white leading edges usually followed by black; back usually with wavy lines (vermiculations); sides with pink or red spots, many of which have blue borders; young with 8-10 regularly arranged parr marks on sides.
Brook trout, *Salvelinus fontinalis*

Caudal fin nearly square or slightly forked, (may be deeply forked in freshwater populations in eastern Canada) without dark wavy lines on dorsal and caudal fins; lower fins with pure white leading edges, but not usually followed by black; sides with creamy, pink, or reddish spots, not extending onto fins; parr marks vague or irregular, not well defined 9

9 Spots usually large and less numerous; gill rakers on upper limb of first gill arch 7-13, on lower limb 12-19; pyloric caecae 20-74.
Arctic char, *Salvelinus alpinus*

Spots round, small, and numerous; gill rakers on upper limb of first gill arch 3-9, on lower limb 8-14; pyloric caecae 13-47.
Dolly Varden, *Salvelinus malma*

10 Distinct black spots on back and on caudal fin 11

No distinct black spots on back or caudal fin but fine black speckling may be present 13

11 Large black spots on back and caudal fin, the largest as large as eye; scales small, 169-229 in first row above lateral line; gill rakers 26-34.

Pink salmon, *Oncorhynchus gorbuscha*

Spots on back and caudal fin small, largest as large as pupil of eye; scales moderate, fewer than 154 in first row above lateral line; gill rakers 19-28 12

12 Small black spots on both lobes of caudal fin; flesh at base of teeth of lower jaw black; pyloric caecae 140-185; gill rakers 20-28.

Chinook salmon, *Oncorhynchus tshawytscha*

Small black spots when present on tail on upper lobe only; flesh at base of teeth of lower jaw pale; pyloric caecae 45-80; gill rakers 19-25.

Coho salmon, *Oncorhynchus kisutch*

13 Gill rakers on first arch 30-40, long, slender and crowded; pyloric caecae 60-115.

Sockeye salmon (or kokanee), *Oncorhynchus nerka*

Gill rakers on first arch 19-26, short, stout and widely spaced; pyloric caecae 140-186.

Chum salmon, *Oncorhynchus keta*

14 Dorsal fin base equal to or longer than head, dorsal fin usually with more than 17 rays, fin large and sail-like on fishes 8 inches or larger; colour of back bluish or purple, dorsal and pelvic fins sometimes with green or reddish spots.

Arctic grayling, *Thymallus arcticus*

Dorsal fin base shorter than head, dorsal fin rays fewer than 17; dorsal fin not expanded; colour usually silvery, back sometimes black, blue, or green.

Whitefishes (Coregoninae) 15

15 A single small flap of skin between nostrils; snout pinched, rather pointed, mouth inferior; gill rakers stout, short, usually 13-20 but to 26 in Alberta and British Columbia.
Round whitefishes, *Prosopium* spp. 16

Two small flaps of skin between nostrils, snout not pinched but usually somewhat broad; mouth inferior, overhung by snout, or mouth terminal, lower jaw may be projecting beyond upper; gill rakers generally long and slender, more than 22 (except in *Stenodus*) 18

16 Gill rakers 20-25 (rarely 26); scales around caudal peduncle in 20-23 rows.
Mountain whitefish, *Prosopium williamsoni*

Gill rakers 13-20 17

17 Lateral line scales 85-100; scales around caudal peduncle 22-24; pyloric caecae 50-117.
Round whitefish, *Prosopium cylindraceum*

Lateral line scales 55-70; scales around caudal peduncle 18-20; pyloric caecae 15-23.
Pygmy whitefish, *Prosopium coulteri*

18 Mouth inferior, overhung by snout; premaxillaries retrorse; gill rakers usually fewer than 32 19

Upper and lower jaws nearly equal, or lower jaw projecting; premaxillaries antrorse; gill rakers usually more than 32 (except *Stenodus*) 21

19 Gill rakers 19-25, short; maxillary short and broad, its length less than twice its width; lower fins thick, opague, often with bluish cast in life.
Broad whitefish, *Coregonus nasus*

Gill rakers 23-33, long; maxillary longer, its length twice or more the width; lower fins not

especially thick, transluscent, often sprinkled with dark chromatophores 20

20 Scales in lateral line less 90 (70–85); mouth inferior, obviously overhung by snout; minute teeth on premaxillaries, palatines and vomer of juveniles only (under 100 mm long).
Lake whitefish, *Coregonus clupeaformis*

Scales in lateral line more than 90 (91–100); mouth terminal or nearly so; teeth on premaxillaries, palatines and vomer, small but present even on adults.
Undescribed whitefish in Nova Scotia *Coregonus* sp.

21 Body shape pike-like; lower jaw distinctly projecting; gill rakers 19-24; scales, small, 97–110 in lateral line.
Inconnu, *Stenodus leucichthys*

Body shape herring-like; upper and lower jaws equal or nearly so (lower jaw may project slightly); gill rakers more than 32 (commonly 40 or more); scales larger, usually 65-85 (*Coregonus autumnalis*, 86-111).
Subgenus *Leucichthys*, 12 species*

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* Numerous keys to the species of the subgenus *Leucichthys* have been attempted. All of them are unsatisfactory because of the excessive phenotypic plasticity of the ciscoes, hence no attempt to separate them is made here. The most variable and wide ranging species is *C. artedii*.

KEY TO THE SPECIES OF THE FAMILY OSMERIDAE

1 Gill rakers on upper half of arch 4-6; pyloric caecae 8-11; scales in lateral line 70-78, lateral line complete; pronounced concentric marks on operculum.

Eulachon, *Thaleichthys pacificus*

Gill rakers on upper half of arch 8-14; pyloric caecae 0-6; scales in lateral line 65 and fewer, lateral line incomplete; no obvious concentric marks on operculum 2

2 Maxillary extending only to middle of pupil; tongue teeth minute and villiform; pyloric caecae 0-3; snout somewhat rounded; rarely over 120 mm.

Pond smelt, *Hypomesus olidus*

Maxillary extending beyond pupil, usually to posterior margin of eye; tongue teeth from medium conical to large canine; pyloric caecae 4-11; snout more pointed; size larger 3

3 Gill rakers on lower half of arch 27-34, total gill rakers usually over 37; anal rays usually 16-18; base of anal fin more than 3 times eye diameter; no enlarged teeth on tongue; rarely over 135 mm.

Longfin smelt, *Spirinchus thaleichthys*

Gill rakers on lower half of arch 18-24, total gill rakers usually under 37; anal rays usually fewer than 16; base of anal fin about 2.5 times eye diameter; one or two prominent, curved canine teeth on tip of tongue larger; size large to 324 mm.

Rainbow smelt, *Osmerus eperlanus*

KEY TO THE SPECIES OF THE FAMILY HIODONTIDAE

1 Ventral surface keeled from isthmus to anal fin; origin of dorsal fin opposite or behind origin of anal fin; maxillary extends beyond middle of pupil.

Goldeye, *Hiodon alosoides*

Ventral surface keeled from pelvic fins to anal fin; origin of dorsal fin well ahead of origin of anal fin; maxillary short of, or just to, middle of pupil.

Mooneye, *Hiodon tergisus*

KEY TO THE SPECIES OF THE FAMILY UMBRIDAE

1 Pelvic fin small, half as long as pectoral; anal fin of 11 or 12 rays with base about as long as base of dorsal; area between dorsal and anal with blotches; caudal fin spotted.

Blackfish, *Dallia pectoralis*

Pelvic fin large, as long as pectoral; anal fin of 8 or 9 rays with base about half as long as base of dorsal; area between anal and dorsal with vague, vertical bars; prominent vertical black bar at base of caudal; caudal fin not spotted.

Central mudminnow, *Umbra limi*

KEY TO THE SPECIES OF THE FAMILY ESOCIDAE

1 Submandibular pores 10 or more; cheeks and/or opercula not fully scaled 2

Submandibular pores 8 or fewer (rarely 9); both cheeks and opercula more or less fully scaled 3

2 Submandibular pores 12-20; branchiostegal rays 16-19, most often 8 + 10 on each side*; pattern silvery or light ground colour with dark spots, blotches, or vertical stripes; neither cheeks nor opercula completely scaled.
Muskellunge, *Esox masquinongy*

Submandibular pores 10-11 (rarely 9); branchiostegal rays 13-16, most often 7 + 8 on each side; pattern dark ground colour with wavy vertical stripes in young, or horizontal rows of bean-shaped spots in adults; cheeks fully scaled, opercula not so.
Northern pike, *Esox lucius*

3 Submandibular pores 7 or 8 (rarely 9) and branchiostegal rays 14-17, most often 6 + 9 on each side; colour pattern dark ground coat with wavy, vertical stripes in young and golden chain-like markings in adults.
Chain pickerel, *Esox niger*

Submandibular pores 7 or 8 and branchiostegal rays 11-13 on each side 4

4 Branchiostegal rays usually 5 + 7 or 5 + 8 on each side; snout short, convex in upper profile; cardioid scales between pelvics more than 5, and more than 5 in a line from origin of anal fin to dorsal surface; lower fins red to orange.
Redfin pickerel, *Esox a. americanus*

Branchiostegal rays usually 4 + 7 or 4 + 8 on each side; snout longer and concave in upper profile; cardioid scales between pelvics fewer than 5, and fewer than 5 in a line from origin of anal fain to dorsal surface; lower fins dusky to yellow-green.
Grass pickerel, *Esox a. vermiculatus*

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* 8 on ceratohyal, 10 on epihyal

KEY TO THE SPECIES OF THE FAMILY CYPRINIDAE

1 Dorsal fin base long, more than 11 soft rays; dorsal and anal fins each with strong spine, serrated on trailing edge 2

Dorsal fin base short, fewer than 11 rays; no spines in fins (except *Acrocheilus aleuticus* and *Richardsonius balteatus* which may occasionally have 11 rays) 3

2 Two pairs of long barbels on upper jaw; pharyngeal teeth molar-like (1,1,3-3,1,1); gill rakers 21-27; scales in lateral line usually more than 32 (mirror and leather carp are only partially scaled).

Carp, *Cyprinus carpio*

Barbels absent; pharyngeal teeth not molar-like (4-4); gill rakers 37-43; scales in lateral line usually less than 32.

Goldfish, *Carassius auratus*

3 Premaxillaries not protractile (i.e. no groove across snout in midline) 4

Premaxillaries protractile (i.e. with groove across snout) 6

4 Lower jaw conspicuously trilobed, its centre lobe tongue-shaped; body stout; caudal peduncle deep.

Cutlips minnow, *Exoglossum maxillingua*

Lower jaw of normal shape; body flecked with darkened scales or speckled; body streamlined; caudal peduncle slender 5

5 Snout long, projecting far beyond mouth; lateral band indistinct or absent.
Longnose dace, *Rhinichthys cataractae*

Snout scarcely projecting beyond mouth; lateral band prominent; rusty-red lateral band on spawning males.
Blacknose dace, *Rhinichthys atratulus*

6 Maxillary with barbel (sometimes concealed in maxillary groove) 7

Maxillary without a barbel 16

7 Barbel terminal and slender, at or near end of maxillary 8

Barbel in front of posterior end of upper jaw, often hidden in groove above maxillary 23

8 Scales in lateral line very small, 90 or more; body deep, about 25% of total length.
Tench, *Tinca tinca*

Scales in lateral line fewer than 80; body depth moderate, 20% or less of total length 9

9 Mouth large, gape extending to below anterior margin of eye; pectoral fins long, narrowed, and pointed, the tips reaching to anterior base of pelvic fins or nearly so; lateral line scales 48-59.
Flathead chub, *Platygobio gracilis*

Mouth moderate to small, gape not extending to anterior margin of eye; pectoral fins rounded or bluntly pointed, not reaching base of pelvic fins 10

10 Lateral line scales 52 or more 11

Lateral line scales less than 50 13

11 Lateral line scales 68-79; pelvic axillary scale well developed.
Peamouth chub, *Mylocheilus caurinum*

Lateral line scales 52-65; pelvic axillary scale absent or weakly developed 12

12 No fleshy stays on dorsal aspect of pelvic fins; lateral line scales 54-65; body sometimes with specialized darkened scales.
Lake chub, *Couesius plumbeus*

Conspicuous fleshy stays on dorsal aspect of pelvic fins, joining fin rays to body; body conspicuously speckled; lateral line scales 52-57.
Leopard dace, *Rhinichthys falcatus*

13 Snout projecting only slightly beyond mouth 14

Snout projecting considerably beyond mouth 15

14 Angle enclosed by scale radii about 70°-75°; caudal spot large and distinct; snout length into standard length more than 9 times; distinct mid-dorsal line and lateral band.
Hornyhead chub, *Nocomis biguttatus*

Angle enclosed by scale radii 95°-105°; no caudal spot; snout length into standard length 8 or less; no mid-dorsal line; lateral band indistinct.
River chub, *Nocomis micropogon*

15 Body with X-shaped dark spots.
Spotted chub, *Hybopsis x-punctata*

Body without definite spots; scales large and deciduous; lower 3 or 4 rays of caudal fin unpigmented.
Silver chub, *Hybopsis storeriana*

16 Lateral line scales more than 55 17

Lateral line scales 54 or fewer 25

17 Mouth terminal, not overhung by snout; gape small or large 18

Mouth inferior, overhung by snout; gape small 22

18 Peritoneum black; lateral line incomplete; body robust, not noticeably compressed; size small, to about 76 mm (3 inches) 19

Peritoneum silvery or speckled, not black; lateral line complete; body laterally compressed or elongate and pike-like; size larger, to 89 mm (3.5 inches) or more 20

19 Intestine with 2 crosswise coils in addition to main loop; mouth small, terminating distinctly in advance of eye; a dark line, entire or broken, between lateral band and back.
Redbelly dace, *Chrosomus eos*

Intestine shorter, with single main loop; mouth larger, extending almost to below anterior margin of eye; back uniformly pigmented.
Finescale dace, *Chrosomus neogaeus*

20 Pelvic fin origin not in advance of dorsal fin, dorsal inserted over pelvic fin origin; body elongate, not markedly compressed; young with small but precise black spot at caudal base.

Squawfish, *Ptychocheilus oregonense*

Pelvic fin origin in advance of dorsal fin origin; body laterally compressed; no black spot at caudal base 21

21 Dorsal rays 9 or 10 (seldom 8); anal rays 10-22, usually 15; snout short, less than eye diameter.

Redside shiner, *Richardsonius balteatus*

Dorsal rays 8; anal rays 9 (seldom 10); snout long and pointed, greater than eye diameter.

Redside dace, *Clinostomus elongatus*

22 Lower jaw with a hard and almost straight cutting edge (like a chisel); anal rays 9; peritoneum jet black.

Chiselmouth, *Acrocheilus alutaceum*

Lower jaw with fleshy lip, mouth sucker-like; anal rays 7; peritoneum dark brown.

Speckled dace, *Rhinichthys osculus*

23 Scales in lateral line fewer than 50; young with distinct mid-lateral black band; each scale with dense pigment anteriorly.

Fallfish, *Semotilus corporalis*

Scales in lateral line more than 50; scales without black pigment anteriorly 24

24 A black spot near anterior base of dorsal fin, sometimes indistinct in young; upper jaw extending to vertical through front of eye; lateral

line scales 52-62; silvery, no distinct spawning colour.
Creek chub, *Semotilus atromaculatus*

No black spot on dorsal fin; upper jaw not reaching a vertical through front of eye; barbel often small or absent; lateral line scales 65-75; sides often with scattered, darkened scales; spawning males with red on flanks and belly.
Pearl dace, *Semotilus margarita*

25 Abdomen behind pelvic fins with a fleshy keel lacking scales; lateral line strongly decurved, following ventral outline of body; anal fin rays 12 or 13.
Golden shiner, *Notemigonus crysoleucas*

Abdomen behind pelvic fins rounded over and scaled; lateral line not strongly decurved; anal fin rays usually less than 12 26

26 A dark spot (sometimes faint) at front of dorsal fin, slightly above base; back flattish; first dorsal ray separated by membrane from first well-developed ray; pre-dorsal scales small, crowded 27

No dark spot at front of dorsal fin above base (a dark pigmented area at anterior base in *Notropis umbratilis*); back scarcely flattened; first dorsal ray closely attached to first well-developed ray; pre-dorsal scales usually large and distinct..... 28

27 Lateral line incomplete; caudal spot faint; mouth terminal but small.
Fathead minnow, *Pimephales promelas*

Lateral line complete; a distinct caudal spot; mouth subterminal.
Bluntnose minnow, *Pimephales notatus*

28 Mouth very small and nearly vertical; dorsal fin rays typically 9.
Pugnose minnow, *Opsopoeodus emiliae*

Mouth larger; dorsal fin rays typically 8 29

29 Anal fin rays 9-12 (rarely 8) 30

Anal fin rays 7 or 8 (rarely 9) 33

30 Origin of dorsal fin over, or in front of, vertical through insertion of pelvic fins; lateral scales twice as high as wide; lower fins of males red during spawning.
Creek shiner, *Notropis cornutus**

Origin of dorsal fin behind vertical through insertion of pelvic fins; scales round or nearly so 31

31 Body deep, depth equal to or more than length of head; dorsal fin with black pigmented area at anterior base; sides stippled with pigment; spawning males have bluish body, and rosy lower fins.
Redfin shiner, *Notropis umbratilis*

Body slender, depth much less than length of head; no black spot at base of dorsal fin 32

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* *N. chrysocephalus* has been described as a species distinct from *N. cornutus*; chin usually pigmented; pre-dorsal, dorso-lateral scale rows 13-16 in *chrysocephalus*; chin usually unpigmented; pre-dorsal, dorso-lateral scale rows 18-24 in *cornutus*. See Gilbert, C.R., 1964, Bull. Fla. St. Mus. 8(2):95-194, and Miller, R.J., Copeia 1968 (3):640-647, for opposing opinions.

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32 Snout sharp, its length more than two-thirds distance from posterior margin of eye to posterior margin of gill-cover; pigmentation on sides usually bordered below by lateral line.

Rosyface shiner, *Notropis rubellus*

Snout blunt, its length less than two-thirds distance from posterior margin of eye to posterior margin of gill-cover; pigmentation on sides terminating above lateral line.

Emerald shiner, *Notropis atherinoides*

33 Intestine short, with single main loop; mouth usually terminal (subterminal for *N. blennius* and *N. hudsonius*) 34

Intestine elongate, coiled on right side; mouth subterminal 42

34 Dorsal fin with black blotch on membranes between posterior rays (except in young); eye less than one-quarter length of head in adults; snout sharp or pointed.

Spotfin shiner, *Notropis spilopterus*

Dorsal fin without black blotch on membranes between posterior rays; eye more than one-quarter length of head in adults; snout not sharp or pointed 35

35 Lateral band indistinct or absent, sometimes diffuse posteriorly; body somewhat compressed, and deep; mouth subterminal 36

Lateral band usually distinct (less so on *N. volucellus* and *N. stramineus*), often extending onto head; body slender; mouth usually terminal 37

36 A large, conspicuous black spot at base of caudal fin (particularly obvious on young); scales in lateral line 36-39; anal rays 8.
Spottail shiner, *Notropis hudsonius*

No black spot at caudal base; scales in lateral line 35-37; anal rays 7.
River shiner, *Notropis blennius*

37 Lateral band usually dark and obvious, continued forward through eye and onto snout; lateral line usually incomplete 38

Lateral band weakly developed or dusky, not continued forward through eye; lateral line complete 41

38 Mouth very small, almost vertical; upper jaw extending only to vertical through nostril; lateral line nearly or quite complete; peritoneum black.
Pugnose shiner, *Notropis anogenus*

Mouth larger, upper jaw reaching beyond a vertical through nostril almost to below eye; lateral line incomplete; peritoneum silvery 39

39 Lateral band on chin (chin black), and on premaxillaries.
Blackchin shiner, *Notropis heterodon*

Lateral band on snout but not on chin (chin not black) 40

40 Anal rays typically 8; dorsal fin located behind vertical through pelvic insertion.
Blacknose shiner, *Notropis heterolepis*

Anal rays typically 7; dorsal fin inserted over or before a vertical through pelvic insertion.
Bridle shiner, *Notropis bifrenatus*

41 Anal rays usually 8 (sometimes 9); black pigment about anus and base of anal fin; pigmentation extending below lateral line.
Mimic shiner, *Notropis volucellus*

Anal rays usually 7; little or no black pigment about anus or base of anal fin, nor below lateral line.
Sand shiner, *Notropis stramineus*

42 Dorsal fin rounded; scales with about 20 radii in adult; colour brassy.
Brassy minnow, *Hybognathus hankinsoni*

Dorsal fin somewhat falcate; scales with about 10 radii in adult; colour silvery.
Silvery minnow, *Hybognathus nuchalis*

KEY TO THE SPECIES OF THE FAMILY CATOSTOMIDAE

1 Dorsal fin with long base and more than 20 rays, first 4-7 rays of dorsal extended to form pointed or rounded lobe at least as high again as rest of fin; distance from insertion of dorsal to origin of caudal less than dorsal fin base 2

Dorsal fin with short base and fewer than 20 rays, no rounded or pointed anterior lobe, rays a uniform gradation in length; distance from insertion of dorsal to origin of caudal greater than dorsal fin base 3

2 Dorsal fin with moderate anterior lobe, first ray about 3 times as long as shortest dorsal ray; mouth horizontal to oblique,

subterminal but little overhung by snout, mouth larger - maxillary twice eye diameter; caudal fin with shallow fork.
Bigmouth buffalo, *Ictiobus cyprinellus*

Dorsal fin with very high, pointed, anterior lobe, first ray at least 4 times as long as shortest ray; mouth, horizontal, inferior and markedly overhung by snout, mouth small - maxillary about equal to eye diameter; caudal with deep fork.
Quillback, *Carpiodes cyprinus*

3 Lateral line present; snout rounded; mouth horizontal, inferior and overhung by snout; greatest body depth less than one-third the scaled length 4

Lateral line absent; snout broadly pointed; mouth oblique and only subterminal, not noticeably overhung by snout; greatest depth one-third or greater than one-third of scaled length; dorsal fin appears large for body length; wide, horizontal, mid-lateral black band except in largest specimens; usually no more than 120-150 mm (5-6 inches) in length.
Lake chubsucker, *Erimyzon sucetta*

4 Side of body with prominent spotted pattern, approximately 10 horizontal rows of dark spots about the size of the pupil, one on each scale.
Spotted sucker, *Minytrema melanops*

No such pattern of small spots 5

5 Head large and broad, depression between eyes; eyes very high and past midpoint of head; snout long and markedly turned down;

body pattern of dark blotches and 3 wide, oblique bars; usually not over 200 mm (8 inches) in length.
Northern hog sucker, *Hypentelium nigricans*

Head convex or rounded on top, eyes lower, and approximately in middle of head 6

6 Scales small, more than 55 in lateral line; swim bladder with 2 chambers; body cylindrical (*Catostomus*) 7

Scales larger, fewer than 50 in lateral line; swim bladder with 3 chambers; body subcylindrical to laterally compressed (*Moxostoma*) 11

7 Scales small, over 90 in lateral line 8

Scales larger, fewer than 90 in lateral line 9

8 Lower lip not completely cleft, 3 rows of papillae cross the base; 3 or 4 rows of papillae on upper lip; cartilagenous edge of jaws obvious inside lips when mouth open; sometimes a notch at point of lateral connection of upper and lower lips; least caudal peduncle depth less than one-half length of dorsal base; membranous connection between base of pelvic fins and body; not over 375 mm (15 inches) in length.
Bridgelip sucker, *Catostomus columbianus*

Lower lip completely cleft, no rows of papillae cross base, at most one row of small papillae on floor of cleft; only 2 rows of papillae on upper lip; cartilagenous edge of jaw not conspicuous without pulling lips back; never a notch at point of lateral connection of upper and lower lips; least caudal peduncle depth more than one-half length of dorsal base; no membranous stays between pelvic fins and body.
Longnose sucker, *Catostomus catostomus*

9 Lower lip incompletely cleft, 3 or 4 rows of papillae crossing base; cartilagenous edge of jaws visible inside lips when mouth open; pronounced notch at point of lateral connection of upper and lower lips; anterior margin of upper lip not pappilate, no upper lip papillae visible from front; more than 15 oblique rows of scales from lateral line to origin of dorsal; never more than 200 mm (8 inches) in length.

Mountain sucker, *Catostomus platyrynchus*

Lower lip completely cleft, no rows of papillae crossing base; cartilagenous edge of jaws not conspicuous; no notch at point of lateral connection of lips, papillae of upper lip visible from front; fewer than 15 oblique rows of scales from lateral line to origin of dorsal; size at least to 610 mm (24 inches) in length 10

10 Lower lip much wider than its height; oblique rows of scales from lateral line to dorsal origin 8-10; dorsal fin rays 10-12; least caudal peduncle depth more than one-half length of dorsal fin base; no membranous connection between pelvic fins and body.

White sucker, *Catostomus commersoni*

Lower lip almost as high as wide; oblique rows of scales from lateral line to dorsal origin 11-14; dorsal fin rays usually 13-15 (rarely 12 or 16); least caudal peduncle depth less than one-half the dorsal fin base; membranous connection between pelvic fins and body.

Largescale sucker, *Catostomus macrocheilus*

11 Scales around the caudal peduncle equal 16 12

Scales around the caudal peduncle equal 12 or rarely 13 13

12 Maximum depth into scaled length of body less than 3½ times; tip of snout to centre of pupil less than centre of pupil to posterior edge of operculum; plicae of lips crossed by transverse lines; lower lips meet mid-ventral at an acute angle.
Copper redhorse, *Moxostoma hubbsi*

Maximum depth into scaled length of body about 4 times or over; tip of snout to centre of pupil greater than centre of pupil to posterior edge of operculum; no transverse lines crossing plicae; lower lips meet at an obtuse angle.
Greater redhorse, *Moxostoma valenciennesi*

13 Maximum depth into scaled length 3.5 times or less; plicae of lips with distinct transverse lines, lower lip thin.
Silver redhorse, *Moxostoma anisurum*

Maximum depth into scaled length about 4 times or more; no transverse lines crossing plicae of lips, lower lip thicker 14

14 Origin of pelvic fins anterior to the mid-point of the base of the dorsal fin; lower pharyngeal arch heavy and triangular; teeth increasing in size toward bottom, subcylindrical and reduced in number.
River redhorse, *Moxostoma carinatum*

Origin of pelvic fins opposite the mid-point of the base of the dorsal fin; lower pharyngeal less heavy not triangular; teeth compressed, comb-like, and numerous 15

15 Eye diameter equal to about one-half the maximum width of the lips; nostrils above the tip of the maxillary.
Black redhorse, *Moxostoma duquesnei*

Eye diameter equal to two-thirds or more of the maximum width of the lips; nostrils behind the tip of the maxillary 16

16 Posterior edge of lower lips nearly a straight line; mouth small, lips not reaching maximum width of snout; mouth overhung by snout; head roundly pointed, contained 4.3-5.4 times in standard length.
Northern redhorse, *Moxostoma macrolepidotum*

Posterior edge of lower lips a definite obtuse angle; head more flattened at front; mouth larger, lips reaching maximum width of snout; mouth little overhung by snout.
Golden redhorse, *Moxostoma erythrurum*

KEY TO THE SPECIES OF THE FAMILY ICTALURIDAE

1 Adipose fin short, fleshy, free at posterior end, obviously well separated from the caudal fin; tail round, squared, or forked; can be up to 610 mm (24 inches) in length 2

Adipose fin long, low, a simple, ridge-like extension of the caudal fin, with or without a notch marking point of connection; tail round, or squared; never over 305 mm (12 inches) in length 5

2 Caudal fin deeply forked; obvious bony ridge connecting skull and origin of dorsal; barbels at corners of mouth more than 3 times as long as those near nostrils.
Channel catfish, *Ictalurus punctatus*

Caudal fin round, square, or slightly indented, never deeply forked; area between head and origin of dorsal compressable, no bony ridge; barbels at corners of mouth about twice as long as those near nostrils 3

3 Upper barbels grey to yellow, lower barbels yellow to white; depressed anal fin overlaps anterior rays of caudal fin; distance from isthmus notch to lower jaw notch much less than distance from lower jaw notch to tip of lower jaw.

Yellow bullhead, *Ictalurus natalis*

Upper and lower barbels dark brown to black; anal fin does not reach anterior rays of caudal fin; distance between isthmus and lower jaw notches close to distance from lower jaw notch to tip of lower jaw 4

4 Barbs on trailing edge of pectoral spines strong even near tip, and catch fingernail when moved toward tip; anal rays usually 21-24; dorsal ray membranes not noticeably darkened.

Brown bullhead, *Ictalurus nebulosus*

Barbs on trailing edge of pectoral spines weak or absent, especially near tip, if present near base, barbs usually catch fingernail only when moved toward base; anal rays usually 17-21; dorsal ray membranes usually noticeably darkened.

Black bullhead, *Ictalurus melas*

5 Dorsal surface more or less flat to origin of adipose fin, greatest depth, at origin of dorsal, into body length to base of caudal rays over 6 times; strongly countershaded, dark above, yellow to white below, small white to yellow spot at dorsal insertion; premaxillary tooth patch with lateral extensions; can be to 305 mm (12 inches) in length.

Stonecat, *Noturus flavus*

Dorsal surface rises to obvious apex at dorsal origin, greatest depth into body length

to base of caudal rays about 4 times; generally dark, or pale with dark saddles and bars; premaxillary tooth patch without lateral extensions; never over 152 mm (6 inches) in length 6

6 Body pale, conspicuously marked with dark saddles and bars; ventral surface white to yellowish; caudal fin outlined in black and white; very strong barbs on pectoral spines; dorsal spine at least three-quarters maximum height of dorsal fin.
Brindled madtom, *Noturus miurus*

Body generally dark, ventral surface dusky, often 3 noticeable dark horizontal lines behind dorsal fin; myotomes often obvious; caudal fin dusky; no barbs on pectoral spines; dorsal spine not more than one-half maximum height of dorsal fin.
Tadpole madtom, *Noturus gyrinus*

KEY TO THE SPECIES OF THE FAMILY CYPRINODONTIDAE

1 Gill rakers usually 5, widely spaced and obvious; branchiostegal rays 6,6, never 5,5; distance from origin of dorsal to end of vertebral column when stepped forward from dorsal fin origin, reaches a point about middle of eye.
Banded killifish, *Fundulus diaphanus*

Gill rakers usually 9 or more, crowded and not obvious; branchiostegal rays 5,5, rarely 6,6; distance from origin of dorsal fin to end of vertebral column when stepped forward from dorsal fin origin, reaches to posterior half of operculum.
Mummichog, *Fundulus heteroclitus*

KEY TO THE SPECIES OF THE FAMILY GADIDAE

1 Two dorsal fins, base of first short, length of base of second 6 or more times that of the first; one anal fin.

Burbot, *Lota lota*

Two dorsal fins, bases of near equal length; two anal fins.

Tomcod, *Microgadus tomcod*

KEY TO THE SPECIES OF THE FAMILY GASTEROSTEIDAE

1 Dorsal spines usually 9 (7-12), short and inclined alternately to left and right; gill membranes united but entirely free from isthmus; a median ventral plate present; no bony plates on sides.

Ninespine stickleback, *Pungitius pungitius*

Dorsal spines 3-6; gill membranes united to isthmus; lateral bony plates present or absent 2

2 Dorsal spines 4, 5 or 6; spines may be long or short; no bony plates on sides; belly posterior to pelvic bases not plated 3

Dorsal spines 3 (rarely 2 or 4), usually with vertical bony plates along sides; a long bony plate extending posteriorly from pelvic bases 4

3 Dorsal spines 4, 5 or 6, short; pelvic spines also short; length of all spines

less than eye diameter.
Brook stickleback, *Culaea inconstans*

Dorsal spines 4 (rarely 5), long, inclined alternately to left and right; length of first and second dorsal spines and pelvic spines distinctly greater than eye diameter.
Fourspine stickleback, *Apeltes quadracus*

4 Pelvic fin of one spine and one soft ray, spine with one pointed cusp at base; caudal peduncle with a keel; body without round black spots; colour in life, green, blue or silvery.
Threespine stickleback, *Gasterosteus aculeatus*

Pelvic fin of one spine and 2 soft rays, spine with 2 well-developed pointed cusps at base; caudal peduncle keelless; many round black spots along sides; colour in life, lemon-yellow.
Blackspot stickleback, *Gasterosteus wheatlandi*

KEY TO THE SPECIES OF THE FAMILY SERRANIDAE

1 Dorsal fins slightly joined at base by membrane; sort anal rays 9 or 10; anal spines stout, not graduated in length, second and third spines subequal; no teeth on base of tongue; no lateral stripes.
White perch, *Roccus americanus*

Dorsal fins entirely separated at base; soft anal rays 10 to 13; anal spines graduated in length; fine teeth at base of tongue; 4 to 7 lateral stripes 2

2 Soft anal rays 12 or 13; anal spines slender, the longest spine equal to or greater than one-half height of fin.
White bass, *Roccus chrysops*

Soft anal rays 10 or 11; anal spines more slender, longest spine less than one-half height of fin.
Striped bass, *Roccus saxatilis*

KEY TO THE SPECIES OF THE FAMILY CENTRARCHIDAE

1 Dorsal spines 10-12; branchiostegal rays 6 (rarely 5); base of anal fin into base of dorsal fin 1.5-3 times 2

Dorsal spines 6-8; branchiostegal rays 7; base of anal fin equal to, or slightly longer than base of dorsal (crappies, *Pomoxis*) 9

2 Anal spines 6; spines arise in a scaled groove; body with 7-9 horizontal rows of black spots below lateral line; base of anal about 1.5 times into base of dorsal.
Rock bass, *Ambloplites rupestris*

Anal spines 3, not in groove, no horizontal rows of spots below lateral line, base of anal into base of dorsal 2.1-3.3 times 3

3 Lateral line scales more than 55; greatest depth into standard length 3-3.3 times (basses, *Micropterus*) 4

Lateral line scales fewer than 50; greatest depth into standard length 2-2.5 (sunfishes, *Lepomis*) 5

4 Upper jaw extends at least to mid-pupil but not beyond eye; connection between dorsal fins higher, shortest spine more than one-half the longest; 68-81 scales in lateral line; pelvic fins joined by membrane, membrane connecting fins to body hidden; young with conspicuous orange and black bands on caudal fin.

Smallmouth bass, *Micropterus dolomieui*

Upper jaw extends beyond eye; connection between dorsal fins lower, shortest spine less than one-half the longest; 58-69 scales in lateral line; pelvic fins not joined by membrane, membrane connecting fins to body obvious; young without colourful pigment on caudal fin but with prominent lateral band.

Largemouth bass, *Micropterus salmoides*

5 Opercular flap in life with black centre and yellow, orange, or red spots or band around margin (in preserved specimens the once coloured areas are white or colourless) 6

Opercular flap in life all black, not marked or edged by yellow, orange, or red in life (not edged with white or colourless in preserved specimens) 7

6 Pectoral fins longer, 3 times in standard length, pointed at leading edge; gill rakers very short and knobbed; opercular flap short, black in centre, edged with white or yellow, with prominent well defined red spot at posterior edge.

Pumpkinseed, *Lepomis gibbosus*

Pectoral fins shorter, 4 times in standard length and rounded; gill rakers short but not knobbed; opercular flap longer, black in centre, edged with yellow, orange, or red, no prominent precise red spot 8

7 Black area of opercular flap usually as deep as long, bony edge of flap entire, not crenate; gill rakers long and slender; pectoral fin long and pointed; base of anal fin into base of dorsal fins 2.0-2.3 times;ventral edge of preopercle finely serrate; black spot at posterior base of second dorsal fin.
Bluegill, *Lepomis macrochirus*

Black area of opercular flap usually longer than deep; bony edge of flap crenate; gill rakers short and stout; pectoral fin short and rounded; base of anal into base of dorsals 2.3-2.6 times; preopercle not serrate; no black spot at posterior base of second dorsal fin.
Redbreast sunfish, *Lepomis auritus*

8 Opercular flap as deep as long, black area edged with red and/or yellow, most prominently on bottom and end; bony edge entire, not crenate; scales smaller, 44 or more in lateral line, 8-10 diagonal rows of scales between lateral line and dorsal origin.
Green sunfish, *Lepomis cyanellus*

Opercular flap long, narrow, turned up, black area completely edged with red and/or yellow; bony edge crenate; scales larger, 39 or more in lateral line, 4-6 diagonal rows between lateral line and dorsal origin.
Longear sunfish, *Lepomis megalotis*

9 Dorsal spines 6; base of anal fin longer than base of dorsal fins; eye diameter 6 times in head, 2 times in snout; body pale with 6-8 vertical bars (prominent in life).
White crappie, *Pomoxis annularis*

Dorsal spines 7 or 8; base of anal fin equal to base of dorsal fin; eye diameter 4-5 times in head, less than 2 times in snout; body darkly and irregularly blotched with black.
Black crappie, *Pomoxis nigromaculatus*

KEY TO THE SPECIES OF THE FAMILY PERCIDAE

1 Mouth large, maxillary extending to midpoint of eye or beyond; lower borders of preopercle obviously serrate; branchiostegals 7 or 8; moderate to large fish 2

Mouth small, maxillary usually not extending beyond anterior margin of eye; lower borders of preopercle smooth, not serrate; branchiostegals 6 (rarely 5); small bottom dwellers, never over 152 mm (6 inches) in length. (darters) 4

2 Anal fin with 2 spines and 6-8 soft rays; teeth in lower jaw all about equal height, no canines on tip; space between pelvic fins less than width of base of one fin; body deeper and laterally compressed, with 6-8 wide dark vertical bars.

Yellow perch, *Perca flavescens*

Anal fin with 2 spines and 12 or 13 soft rays; canine teeth present, usually two on tip of lower jaw; space between pelvic fins equal to base of one fin; body shallower and subcylindrical 3

3 Rays of second dorsal fin usually 18-22; membrane of first dorsal dusky without definite spots, a large black blotch at posterior base of spinous dorsal in adults; lower lobe of caudal fin with white tip; in adults, cheek scales small, hard to see, cheek and operculum naked at 152 mm (6 inches)

in length; 3 pyloric caecae each about as long as stomach; 5-7 dark saddles on back.
Walleye, *Stizostedion vitreum**

Rays of second dorsal fin usually 17-20; membrane of first dorsal clear with definite spots, in young, pigment confined to upper edge, no large blotch at posterior base; lower lobe of caudal fin without white tip; in adults cheek scales more apparent, cheek naked but scales on operculum obvious at 152 mm (6 inches) in length; usually 5 (3-9) pyloric caecae, each shorter than stomach; back with 3 or 4 saddles which become patches below fins and on peduncle.
Sauger, *Stizostedion canadense*

4 Anal fin large, equal to or larger than soft dorsal fin; pelvic fins well separated; caudal fin usually slightly forked; lateral line usually complete; space between pelvic bases and along belly either naked or with enlarged ctenoid scales, females sometimes with only one enlarged scale between pelvic fins; body usually elongate and shallow 5

Anal fin smaller than soft dorsal fin; distance between pelvic fins variable, from width of pelvic base to one-half pelvic base; caudal fin slightly forked, square or rounded; lateral line complete or incomplete; space between pelvic fins and along belly either naked or with scales, but scales never enlarged, body usually somewhat compressed laterally 9

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* No attempt is made to separate here the subspecies *Stizostedion vitreum glaucum*, the blue pike. The species occurred only in Lakes Erie and Ontario and apparently has been extirpated. Specimens of a dull grey form reported from various inland lakes have proven to be colour mutants of the walleye, *S. v. vitreum*.

5 Flesh pellucid in life; anal fin with a single thin spine; dorsal fins widely separated; body extremely elongate and partially naked, with scales confined to midline of sides; a series of 10-12 small, rounded, green spots along midline of sides.

Sand darter, *Ammocrypta pellucida*

Flesh opague; anal fin with 2 spines; dorsal fins not widely separated; body usually scaled 6

6 Premaxillaries protractile, clearly separated from snout by a deep groove; a series of small brown oblong or round blotches along sides, frequently joined together by a thin line.

Channel darter, *Percina copelandi*

Premaxillaires not protractile (a shallow groove may be evident in *P. shumardi*) 7

7 Snout prolonged to from a conical protuberance, projecting beyond upper jaw; lateral line scales 78-103; body with 14-16 dark vertical bars, alternate bars being expanded and drop-like at lower ends; a distinct black spot at caudal base.

Logperch, *Percina caprodes*

Snout not prolonged, not projecting beyond upper jaw; lateral line scales fewer than 78; body with lateral blotches, with or without black spot at caudal base 8

8 Cheeks scaleless; midline of belly scaleless but with a bridge of scales before anus; a prominent suborbital bar; anal fin

usually large, the rays long, reaching almost to base of caudal fin; sides with 9 or 10 blotches or bars.
River darter, *Percina shumardi*

Cheeks scaled; midline of belly scaled; suborbital bar present; anal fin not unusually large, not reaching to caudal base; sides with a series of black, oblong, confluent blotches and continuous with a black band that extends across gill cover and around snout.
Blackside darter, *Etheostoma maculatum*

9 Premaxillaries protractile; one thin anal spine; body usually with X-, M-, or W-shaped markings on sides.
Johnny darter, *Etheostoma nigrum**

Premaxillaries not protractile, usually bound to snout by fleshy bridge (the frenum) or fused to preorbitals at sides (*E. blennioides*); two anal spines, the first usually stout and stiff 10

10 Gill membranes not obviously joined but meeting in a V over isthmus 11

Gill membranes broadly joined by a sheet of tissue covering isthmus but free from it 13

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* Throughout its North American range *Etheostoma (Boleosoma) nigrum* was considered for many years to be represented by three subspecies, all of which occurred in Canadian waters, *E. n. olmstedi* from Maritime provinces to eastern Lake Ontario drainages, *E. n. eulepis* in Great Lakes basin and *E. n. nigrum* from Saskatchewan and Hudson Bay to western Quebec. However, Cole (1967) elevated *olmstedi* to full species status but as yet the occurrence of this species *E. olmstedi* Storer in Canadian waters is not clearly defined.

11 Cheeks scaled (scales sometimes covered lightly with tissue); dorsal soft rays usually 10 or 11; lateral line ending under spinous dorsal fin; 10-12 dark vertical bars on sides, not extending downward to ventral surface; caudal fin distinctly speckled; males colourful in life with blue or green patches between darker bars on sides and blue and red on spinous dorsal fin.

Iowa darter, *Etheostoma exile*

Cheeks naked; dorsal rays usually 12-13, or 8-9; lateral line variously incomplete or absent 12

12 Dorsal rays 12 or 13; dorsal spines 9 or 10; lateral line usually incomplete; 6 dark, vertical bands on body from anus to tail, meeting (or nearly so), on ventral surface; males colourful in life with green, blue, and orange colouration on head, sides, dorsal and anal fins.

Rainbow darter, *Etheostoma caeruleum*

Dorsal rays 8 or 9; dorsal spines 7; lateral line completely absent or with up to 7 pored scales; sides with 7 or 8 squarish, dark patches on sides; a distinct suborbital bar; caudal fin distinctly barred or speckled.

Least darter, *Etheostoma microperca*

13 Dorsal spines 6-8, short, length equal to or shorter than eye diameter, those of males often with fleshy tips; body slender, elongate; head distinctly pointed, mouth terminal; colour in life brownish, with 10-12 short, vertical bars.

Fantail darter, *Etheostoma flabellare*

Dorsal spines 13, not short, length obviously greater than eye diameter and never with fleshy tips; body robust; snout distinctly rounded, overhanging the small mouth; body greenish in life with V-shaped marks that extend below the midline.

Greenside darter, *Etheostoma blennioides*

KEY TO THE SPECIES OF THE FAMILY COTTIDAE

1 Gill membranes free from isthmus; second preopercular spine directed backwards, conspicuous.
Deepwater sculpin, *Myoxocephalus quadricornis*

Gill membranes attached to isthmus; second preopercular spine skin covered, and directed downwards 2

2 Lateral line complete to base of caudal without deflection; upper preopercular spine usually longer than two-thirds eye diameter and curved inwardly; mandibular pores large, one on midline of tip of chin.
Spoonhead sculpin, *Cottus ricei*

Lateral line incomplete, or if complete deflected downwards on caudal peduncle; upper preopercular spine equal to one-half eye diameter and not curved inwardly; mandibular pores small 3

3 Two pores on tip of chin; lateral line complete or incomplete; first 2 dorsal spines not noticeably close together (associated with separate basals); caudal vertebrae 20-24 4

One pore on tip of chin; lateral line complete; first 2 dorsal spines noticeably close together (associated with single basal); caudal vertebrae 24-28 7

4 Lateral line complete; palatine tooth patch long, and in contact with vomerine tooth patch; head length 3 times or less in standard length; prickles on body usually extending onto sides and back; base of prickle serrate; usually 2 narrow, forward-

slanting bars under second dorsal fin; underside of head mottled with large and small speckles.

Torrent sculpin, *Cottus rhotheus*

Lateral line complete or incomplete; palatine tooth patch absent or short, not in contact with vomerine tooth patch; head length usually 3 times or more in standard length; prickles restricted to a small area behind pelvic fin; base of prickle not serrate; either 3 dark bars or none under second dorsal fin; underside of head uniformly speckled 5

5 Palatine teeth absent; anal fin rays usually 10-12; pelvic fin rays 3 or 4, when present the fourth ray usually less than two-thirds length of longest pelvic ray; last 2 dorsal and anal rays often separated, arising from separate basals.

Slimy sculpin, *Cottus cognatus*

Palatine teeth present; anal fin rays usually 12-14; pelvic fin rays 4, the fourth about three-quarters length of the longest ray; last 2 dorsal and anal rays close together, arising from same basal 6

6 Head length usually 2.9-3.2 in standard length; pectoral fin rays usually 14-16; lateral line incomplete and usually of 28-36 pores; preopercular spines 3.

Mottled sculpin, *Cottus bairdi*

Head length usually 3.2-3.9 in standard length; pectoral fin rays usually 13 or 14; lateral line incomplete and usually of 22-33 pores; preopercular spines 2.

Shorthead sculpin, *Cottus confusus*

7 Anal fin rays 15-19; pectoral fin rays 15-18; palatine teeth present; dark, oval spot on upper posterior portion of first dorsal fin.

Prickly sculpin, *Cottus asper*

Anal fin rays 12-16; pectoral fin rays 13-16; palatine teeth absent; dark, oval spot absent on first dorsal fin.

Coastrange sculpin, *Cottus aleuticus*

SPECIES OF DOUBTFUL OCCURRENCE

The species below are fishes which have been recorded from fresh waterin Canada but either so rarely or on such tenuous circumstances as to make doubtful their real establishment in fresh water.

f. Squalidae - dogfish sharks; *Squalus acanthias* Linnaeus - spiny dogfish; B.C., (McAllister, 1959a).

f. Clupeidae - herrings; *Clupea harengus pallasi* Valenciennes - Pacific herring; B.C., (McAllister, 1959a).

f. Salmonidae - salmons, trouts, whitefishes, and grayling; *Salmo aguabonita* Jordan - golden trout; introduction in Alberta of unknown success. *Salmo salar* Linnaeus - Atlantic salmon; recently introduced in lakes in National Parks in Alberta.

f. Cyprinodontidae - killifishes; *Lebistes reticulatus* (Peters) - guppy; Alta. *Mollienesia latipinna* Lesueur - sailfin molly; Alta. *Xiphophorus helleri* Heckel - swordtail; Alta. Aquarium specimens introduced into hot springs near Banff and surviving.

f. Cichlidae - cichlids; *Cichlosoma nigrofasciatum* (Günther) - zebra cichlid; Alta. Aquarium specimens introduced into hot springs near Banff and surviving.

f. Embiotocidae - surfperches; *Cymatogaster aggregata* Gibbons - shiner perch; B.C., (McAllister, 1959a).

f. Cottidae - sculpins; *Clinocottus acuticeps* (Gilbert) - sharpnose sculpin; B.C., (McAllister, 1959a). *Leptocottus armatus* Girard - Pacific staghorn sculpin; B.C., (McAllister, 1959a). *Myoxocephalus quadricornis* (Linnaeus) - fourhorn sculpin; Man.

f. Cyclopteridae - lumpfishes and snailfishes; *Cyclopterus lumpus* Linnaeus - lumpfish; Ont., (Ryder et al, 1964).

f. Ammodytidae - sand lances; *Ammodytes americanus* DeKay - American sand lance; Nfld., (Scott and Crossman, 1964).

f. Bothidae - lefteye flounders; *Scophthalmus aquosus* (Mitchill) - windowpane; Nfld., (Scott and Crossman, 1964).

f. Pleuronectidae - righteye flounders; *Liopsetta putnami* (Gill) - smooth flounder; N.B., Que., Vladykov (pers. comm.) stated that this flounder had been taken in the St. Lawrence River, 30 miles from the sea. There are specimens in the ROM from freshwater in the Waweig River, N.B. MacKenzie (1959) reported them as taken "just above Newcastle" on the Miramichi River where salinities are as low as 0.1%. *Platichthys stellatus* (Pallas) - starry flounder; B.C. The adults of this species have long been known to enter freshwater. The adults as well regularly occur in at least marginal freshwater (see Carl et al, 1959; McAllister, 1959a). *Pseudopleuronectes americanus* (Walbaum) - winter flounder; Nfld., (Scott and Crossman, 1964).

NUMBER OF SPECIES BY GEOGRAPHIC AREAS IN A TOTAL FAUNA OF 183 SPECIES

	Number of Species 1969
Insular Newfoundland	20
Labrador (Nfld.)	21
Nova Scotia	34
Prince Edward Island	19
New Brunswick	48
Quebec	106
Ontario	136
Manitoba	76
Saskatchewan	59
Alberta	53
British Columbia	72
Northwest Territories	41
Yukon Territory	32
Alaska	39

NUMBER OF SPECIES IN MAJOR WATERSHED BASINS

Atlantic	146
Hudson Bay	94
Arctic	56
Pacific	70
Gulf of Mexico	27

ATLANTIC WATERSHED BASIN

146 species

Lampetra lamottei
Ichthyomyzon fossor
Ichthyomyzon unicuspis
Petromyzon marinus
Acipenser brevirostrum
Acipenser fulvescens
Acipenser oxyrhynchus
Lepisosteus oculatus
Lepisosteus osseus
Amia calva
Alosa aestivalus
Alosa pseudoharengus
Alosa sapidissima
Dorosoma cepedianum
Coregonus alpenae
Coregonus artedii
Coregonus clupeaformis
Coregonus hoyi
Coregonus johannae
Coregonus kiyi
Coregonus nigripinnis
Coregonus nipigon
Coregonus reighardi
Coregonus zenithicus
Coregonus sp.
*Oncorhynchus gorbuscha**
Oncorhynchus kisutch?*
*Oncorhynchus nerka**
*Oncorhynchus tshawytscha**
Prosopium coulteri
Prosopium cylindraceum
*Salmo clarki**
*Salmo gairdneri**
Salmo salar
*Salmo trutta**
Salvelinus alpinus
Salvelinus fontinalis
Salvelinus namaycush
Thymallus arcticus?*
Osmerus eperlanus
Hiodon alosoides
Hiodon tergisus
Dallia pectoralis?*
Umbra limi
Esox americanus
Esox lucius
Esox masquinongy
Esox niger
*Carassius auratus**
Chrosomus eos
Chrosomus neogaeus
Clinostomus elongatus
Couesius plumbeus
*Cyprinus carpio**
Exoglossum maxillingua
Hybognathus hankinsoni
Hybognathus nuchalis

Hybopsis storeriana
Hybopsis x-punctata
Nocomis biguttata
Nocomis micropogon
Notemigonus crysoleucas
Notropis anogenus
Notropis atherinoides
Notropis bifrenatus
Notropis chrysocephalus
Notropis cornutus
Notropis heterodon
Notropis heterolepis
Notropis hudsonius
Notropis rubellus
Notropis spilopterus
Notropis stramineus
Notropis umbratilis
Notropis volucellus
Opsopoeodus emiliae
Pimephales notatus
Pimephales promelas
Rhinichthys atratulus
Rhinichthys cataractae
Semotilus atromaculatus
Semotilus corporalis
Semotilus margarita
Carpiodes cyprinus
Catostomus catostomus
Catostomus commersoni
Erimyzon sucetta
Hypentelium nigricans
Ictiobus cyprinellus
Minytrema melanops
Moxostoma anisurum
Moxostoma carinatum
Moxostoma erythrurum
Moxostoma hubbsi
Moxostoma macrolepidotum
Moxostoma valenciennesi
Ictalurus melas
Ictalurus natalis
Ictalurus nebulosus
Ictalurus punctatus
Noturus flavus
Noturus gyrinus
Noturus miurus
Anguilla rostrata
Fundulus diaphanus
Fundulus heteroclitus
Lota lota
Microgadus tomcod
Labidesthes sicculus
Apeltes quadracus
Culaea inconstans
Gasterosteus aculeatus
Gasterosteus wheatlandi
Pungitius pungitius
Percopsis omiscomaycus
Roccus americanus

ATLANTIC WATERSHED BASIN (cont.)

Roccus chrysops
Roccus saxatilis
Ambloplites rupestris
Lepomis auritus
Lepomis cyanellus
Lepomis gibbosus
Lepomis macrochirus
Lepomis megalotis
Micropterus dolomieui
Micropterus salmoides
Pomoxis annularis
Pomoxis nigromaculatus
Ammocrypta pellucida
Etheostoma blennioides
Etheostoma caeruleum
Etheostoma exile
Etheostoma flabellare
Etheostoma microperca
Etheostoma nigrum
Perca flavescens
Percina caprodes
Percina copelandi
Percina maculata
Stizostedion canadense
Stizostedion vitreum
Aplodinotus grunniens
Cottus bairdi
Cottus cognatus
Cottus ricei
Myoxocephalus quadricornis

HUDSON BAY WATERSHED BASIN

94 species

Ichthyomyzon castaneus
Ichthyomyzon unicuspis
Acipenser fulvescens
Coregonus artedii
Coregonus clupeaformis
Coregonus hoyi?
Coregonus nigripinnis
Coregonus nipigon
Coregonus zenithicus
Oncorhynchus gorbuscha?*
Oncorhynchus keta?*
Oncorhynchus tshawytscha?*
Prosopium cylindraceum
Prosopium williamsoni
Salmo clarki
Salmo gairdneri
Salmo salar
*Salmo trutta**
Salvelinus alpinus
Salvelinus fontinalis

Salvelinus malma
Salvelinus namaycush
Thymallus arcticus
Hiodon alosoides
Hiodon tergisus
Umbra limi
Esox lucius
Esox masquinongy
*Carassius auratus**
Chrosomus eos
Chrosomus neogaeus
Couesius plumbeus
*Cyprinus carpio**
Hybognathus hankinsoni
Hybognathus nuchalis
Nocomis biguttata
Nocomis storeriana
Notemigonus crysoleucas
Notropis atherinoides
Notropis blennius
Notropis cornutus
Notropis heterolepis
Notropis hudsonius
Notropis rubellus
Notropis stramineus
Notropis volucellus
Pimephales notatus
Pimephales promelas
Platygobio gracilis
Rhinichthys atratulus
Rhinichthys cataractae
Semotilus atromaculatus
Semotilus corporalis
Semotilus margarita
Carpiodes cyprinus
Catostomus catostomus
Catostomus commersoni
Catostomus platyrhynchus
Ictiobus cyprinellus
Moxostoma anisurum
Moxostoma macrolepidotum
Ictalurus melas
Ictalurus nebulosus
Ictalurus punctatus
Noturus flavus
Noturus gyrinus
Fundulus diaphanus
Gambusia affinis
Lota lota
Culaea inconstans
Gasterosteus aculeatus
Pungitius pungitius
Percopsis omiscomaycus
Ambloplites rupestris
Lepomis cyanellus
Lepomis gibbosus
Lepomis macrochirus
Lepomis megalotis
Micropterus dolomieui
Micropterus salmoides
Pomoxis nigromaculatus
Etheostoma exile
Etheostoma nigrum

HUDSON BAY WATERSHED BASIN (cont.)

Perca flavescens
Percina caprodes
Percina maculata
Percina shumardi
Stizostedion canadense
Stizostedion vitreum
Aplodinotus grunniens
Cottus bairdi
Cottus cognatus
Cottus ricei
Myoxocephalus quadricornis

ARCTIC WATERSHED BASIN

56 species

Lampetra japonica
Coregonus artedii
Coregonus autumnalis
Coregonus clupeaformis
Coregonus laurettae
Coregonus nasus
Coregonus nelsoni
Coregonus nigripinnis
Coregonus sardinella
Coregonus zenithicus
Oncorhynchus gorbuscha
Oncorhynchus keta
Oncorhynchus nerka
Oncorhynchus tshawytscha
Prosopium coulteri
Prosopium cylindraceum
Prosopium williamsoni
Salmo gairdneri
*Salmo trutta**
Salvelinus alpinus
*Salvelinus fontinalis**
Salvelinus malma
Salvelinus namaycush
Stenodus leucichthys
Thymallus arcticus
Hypomesus olidus
Osmerus eperlanus
Hiodon alosoides
Dallia pectoralis
Esox lucius
Chrosomus eos
Chrosomus neogaeus
Couesius plumbeus
Hybognathus hankinsoni
Mylocheilus caurinus
Notropis atherinoides
Notropis hudsonius
Pimephales promelas
Platygobio gracilis
Ptychocheilus oregonensis
Rhinichthys cataractae
Richardsonius balteatus

ARCTIC WATERSHED BASIN (cont.)

Semotilus margarita
Lota lota
Catostomus catostomus
Catostomus commersoni
Catostomus macrocheilus
Percopsis omiscomaycus
Etheostoma exile
Perca flavescens
Stizostedion vitreum
Cottus asper
Cottus cognatus
Cottus ricei
Myoxocephalus quadricornis
Culaea inconstans
Pungitius pungitius

PACIFIC WATERSHED BASIN (+ BERING SEA)
70 species

Lampetra japonica
Entosphenus tridentatus
Lampetra ayresi
Lampetra richardsoni
Acipenser medirostris
Acipenser transmontanus
*Alosa sapidissima**
Coregonus autumnalis
Coregonus clupeaformis
Coregonus pidschian
Coregonus nasus
Coregonus nelsoni
Coregonus sardinella
Oncorhynchus gorbuscha
Oncorhynchus keta
Oncorhynchus kisutch
Oncorhynchus nerka
Oncorhynchus tshawytscha
Prosopium coulteri
Prosopium cylindraceum
Prosopium williamsoni
Salmo clarki
Salmo gairdneri
*Salmo trutta**
*Salvelinus fontinalis**
Salvelinus malma
Salvelinus namaycush
Stenodus leucichthys
Thymallus arcticus
Hypomesus olidus
Osmerus eperlanus
Spirinchus dilatus
Thaleichthys pacificus
Dallia pectoralis
Esox lucius
Acrocheilus alutaceus
*Carassius auratus**
Couesius plumbeus

*Cyprinus carpio**
Hybognathus hankinsoni
Mylocheilus caurinus
Notropis atherinoides
Ptychocheilus oregonensis
Rhinichthys cataractae
Rhinichthys falcatus
Rhinichthys osculus
Richardsonius balteatus
*Tinca tinca**
Catostomus catostomus
Catostomus columbianus
Catostomus commersoni
Catostomus macrocheilus
Catostomus platyrhynchus
*Ictalurus melas**
*Ictalurus nebulosus**
Lota lota
Gasterosteus aculeatus
Pungitius pungitius
Percopsis omiscomaycus
*Lepomis gibbosus**
*Micropterus dolomieui**
*Micropterus salmoides**
*Pomoxis nigromaculatus**
*Perca flavescens**
Cottus aleuticus
Cottus asper
Cottus bairdi
Cottus cognatus
Cottus rhotheus
Cottus confusus

GULF OF MEXICO WATERSHED BASIN
27 species

Prosopium williamsoni
Salmo clarki
Salmo gairdneri
Salmo trutta
Esox lucius
Carassius auratus
Chrosomus eos
Chrosomus neogaeus
Couesius plumbeus
Cyprinus carpio
Hybognathus hankinsoni
Hybognathus nuchalis
Pimephales promelas
Platygobio gracilis
Rhinichthys cataractae
Semotilus margarita
Catostomus catostomus
Catostomus commersoni

Catostomus platyrhynchus
Moxostoma macrolepidotum
Noturus flavus
Lota lota
Culaea inconstans
Etheostoma exile
Perca flavescens
Stizostedion canadense
Cottus bairdi

Two recent publications by Willock (1968; in press) have greatly increased knowledge of the species that occur in those limited drainages in Saskatchewan and Alberta, which are connected with the Missouri River.

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